M.Sc. Geology Revised Syllabus June 2018-19 on wards

I Semester

Code	Paper	Title
15041	Paper I	Geomorphology & Atmospheric Sciences
15042	Paper II	Crystallography, Mineralogy & Optical Mineralogy
15043	Paper III	Paleontology & Stratigraphy
15044	Paper IV	Indian Geology & Field Geology
15041P	Practical I	Crystallography, Mineralogy and Optical mineralogy
15042P	Practical II	Stratigraphy, Paleontology, Field Reports

II Semester

25041	Paper I	Statistics & Computer Applications
25042	Paper II	Structural Geology & Geotectonics
25043	Paper III	Igneous & Metamorphic Petrology
25044	Paper IV	Sedimentology and Marine Geology
25045	Non-Core	Introduction to Earth Resources
25041P	Practical I	Petrology
25042P	Practical II	Statistics, Computer Applications and Structural Geology

III Semester

35041	Paper I	Economic Geology , Mineral Economics & Gemology
35042	Paper II	Energy Resources
35043	Paper III	Remote Sensing & GIS
35044	Paper IV	Geochemistry
35045	Non-Core	Essentials of Remote Sensing and GIS Fundamentals
35041P	Practical I	Economic Minerals and Geochemistry
35042P	Practical II	Remote Sensing & GIS

IV Semester

45041	Paper I	Mineral Exploration, Mining and Ore beneficiation
45042	Paper II	Hydrogeology & Watershed management
45043	Paper III	Engineering Geology & Natural Hazards
45044	Paper IV	Environmental Geology
45041P	Practical I	Geoinformatic Applications in Mineral exploration, Hydrogeology and Engineering Geology
45042P	Practical II	Project Work

- Week end Field Trips for both Previous and Final year Students
- Study Tour for 10 to 14 days for both Previous and Final Year Students

I SEMESTER

15041 Paper I – Geomorphology & Atmospheric Sciences

Unit I

Scope of Geomorphology, Fundamental concepts of Geomorphology. Volcanoes & Volcanism – Nature and Origin of Volcanoes – Products of Volcanism, eruptive styles and associated landforms. Earthquakes and Earth's Interior. Causes, occurrence and effects of Earthquakes. Earth's Interior according to seismic theory. Nature and origin of Oceans and shaping of continents **15 hours**

Unit II

Geological action and resulting land forms of Oceans, Lakes, Glaciers and Wind. 1**5 hours**

Unit III

Geological action and resulting land forms of River. Drainage patterns and systems, Morphometric analysis – Morphometric characteristics, stream orders, stream length, stream frequency, elongation ratio, bifurcation ratio, drainage density, texture and interpretations. **15 hours**

Unit IV

Atmosphere – Circulation – Clouds, Precipitation, Acid rains – The Air – Masses - Cyclones and Anticyclones – Tropical cyclones – Tornadoes. Natural regions of the world – Tropical regions - Warm Temperate regions – Cold temperate regions – Polar regions. . Weather forecasting. Economic importance of weather – Agriculture and Industry. **15 hours**

Reference Books

1. Essentials of Geology by Stanley Chermicoff, Hayden A. Chip Fox. Ramesh Venkatakrishansn.
2. Physical Geology by A.Holmes.
3. Principles of Geomorphology by William D.Thornbury.
4. Principles of Geomorphology by Carls W.Montgomery.
5. Text book of Geomorphology by A.L.Bloom
6. Text book of Geomorphology by P.Dayal
7. Indian Geomorphology by H.S.Sarma.
8. An Introduction to Earth and Environment by A.K.Sinha

15042 Paper II – Crystallography, Mineralogy and Optical Mineralogy

Unit I

Elements of Crystallography – Derivation of 32 Crystal classes and Herman-Maughn Symbols, twin laws and twin crystals, X-ray crystallography and irregularities in crystals, Etch figures.

15 hours

Unit II

Structures of silicates, isomorphism and polymorphism. Physical, chemical and optical properties, mode of occurrence of the following mineral groups: Quartz, Feldspars , Feldspathoids and Zeolites. **15 hours**

Unit III

Physical, chemical and optical characters and mode of occurrence of the following mineral groups -- olivine, pyroxene, amphibole, mica, Garnet and Aluminum silicates. **15 hours**

Unit IV

General principles of optics, Polarizing microscope, Refringence-Birefringence , Double refraction – Snell's Law – Critical angle – Total Reflection, Pleochroism, Extinction, Determination of retardation with Berek compensator, optic axial angle, Uniaxial and biaxial minerals, Gypsum plate, Quartz wedge and mica plate **15 hours**

Reference Books

1. A Text Book of Mineralogy by E.S.Dana
2. Elements of Crystallography by F.A.Wade and R.B.Matrox.
3. Elements of Mineralogy by Rutleys
4. Optical mineralogy by Paul F.F. Kerr
5. Mineral Optics by Philips W.R.
6. Elements of Optical Mineralogy by Winchell A.N.

15043 Paper III - Paleontology and Stratigraphy

Unit I

Concept of Species – Nomenclature – Evolution of Life through Geological Time Scale – Taphonomy – Definition of fossil – Modes of preservation of Fossils – Index fossil – Zone fossil.

15 hours

Unit II

Scope of Micropaleontology – Detailed morphology of Foraminifera, Ostracoda – Utility of Microfossils in Hydrocarbon Exploration – Palaeoecology, Palaeobotony – Plant fossils **15 hours**

Unit III

Morphology, classification and evolutionary history of Mollusks (Lamellibranches, Gastropods and Cephalopods), Echinoderms. Morphology and Evolutionary history of Graptolites, Trilobites, Brachiopods and Corals. Evolution of Vertebrates – Horse, Elephant and Man **15 hours**

Unit IV

Stratigraphy: Definition, scope, history and evolution. Stratigraphic terminology, nomenclature and classification – Concept of Lithofacies and Biofacies - Historical evolution of Geological Time Scale. Principles of Palaeogeography and Palaeoclimate- Sequence Stratigraphy. **15 hours**

Reference Books

1. Fundamentals of Historical Geology and Stratigraphy of India – Ravindra Kumar
2. Geology of India and Burma by M.S.Krishnan.
3. Geology of India by D.N.Waldia
4. Geology of India by M.Ramakrishna & R.Vidyanadhan.
5. Field Geology by F.H.Lahee
6. Manual of Field Geology by Robert R.Compton
7. Guide to Field Geology by S.M.Mathur

15044 Paper IV- Indian Geology and Field Geology

Unit I

Major stratigraphic divisions and their equivalents in India. Brief account of classification, lithology, structure and economic importance of Archaeans, Cuddapahas and Vindhyan Supergroups and their equivalents with a special emphasis on Mineral wealth of Cuddapah Basin

15 hours

Unit II

Gondwana Supergroup, Fossil content of Triassic, Jurassic and Cretaceous formations of India. Short account of Siwaliks and Deccan Traps – Infra and Inter trapeans – Origin, composition, distribution. Tertiary and Quaternary rocks of India. Origin, composition and distribution of Deccan Traps. **15 hours**

Unit III

Age problems pertaining to Indian Stratigraphy a) Saline Series b) Deccan traps. Study of the following boundary problems with reference to India a) Precambrian – Cambrian, b) Permian – Triassic, and c) Cretaceous – Tertiary. **15 hours**

Unit IV

Toposheet and map. Toposheet and map reading. Various methods of locating a point on toposheet and map. Basic field procedure – Determination of slopes and gradient, measuring differences in elevation. Basic field observations at a point or out crop. Geological mapping – General considerations, reconnaissance, study of surface features and rocks. Transfer of field data collected on to a base map, finalization of map, preparation of geological cross section. Contouring – Definition, internal characteristics, direct and indirect methods of contouring and uses. Application of GIS in Mapping

15 hours

Reference Books

1. Invertebrate Paleontology – Henry Woods
2. Principles of Invertebrate Paleontology – Shorock & Twendhofel
3. Elements of Micropaleontology – Bignot. G.
4. Principles of Micropaleontology – F.H.Glessener
5. Principles of Stratigraphy – Lemon, R.R.
6. Principles of Sedimentology and Stratigraphy – Boggs, S.
7. Principles of Stratigraphy – Danbar, C.O., and Rodgers, J.

Practical I
15041P Crystallography, Mineralogy and Optical Mineralogy

Crystallography: Identification of crystal models of 32 crystal classes and their crystals.
Mineealogy: Megascopic identification of minerals
Microscopic identification of minerals in thin sections.

Practical II
15042P Stratigraphy, Palaeontology and Field Geology

Stratigraphy: Stratigrapy problems
Palaeontology: Megascopic identification of fossils
Microscopic identification of microfossils.
Submission of Field reports

II SEMESTER

25041 Paper I - Statistics and Computer Applications

Unit I

Data in Earth Sciences – Classification – Tabulation

Quantitative techniques – Central tendency and dispersion, Correlation and regression, Analysis of one way variance. **15 hours**

Unit II

Introductions to computers – History and generations – Definition and brief description of operating systems, languages and packages, Introduction to Internet **15 hours**

Unit III

MS Office – MS Word, MS Excell, MS Power Point - Description **15 hours**

Unit IV

Basic concepts of data and database management system – RDBMS, SQL. Oracle - Introduction to RDBMS, Data definition languages, data control languages, data control language, creating and managing objects like Tables and Views. RDBMS Query execution, transactions – Physical database design and performance tuning. **15 hours**

Reference Books

1. Computer and Commonsense – Hunt and Sheily
2. The Internet – Dauger and Comer
3. MS Office 2000 – Hand Book
4. Introduction to Data Base Management Systems – Ramakrishna
5. Oracle 8i complete reference – Kevin Loney, George Kochu
6. Fundamentals of Mathematical stastics – Gupta S.C. and Kapoor, V.K.
7. Statistical methods – Snedeca G.W. and Loncron, W.G.

25042 Paper II - Structural Geology and Geotectonics

Unit – I

Mechanical principles and properties of rocks and their controlling factors – Concept of stress and strain – two dimensional stress and strain analyses – Concept of Dip and Strike - Geometric classification of Folds - Mechanics of folding and buckling and recognition of folds.

15 hours

Unit – II

Joints Classification and their importance in Construction projects. Mechanics of faulting. Classification and recognition of faults. Strike slip faults, normal faults. Unconformities – types of unconformities, criteria for recognition and significance of unconformities.

15 hours

Unit – III

Tectonic aspects of Igneous rocks. Geometric classification of plutonic igneous rocks, tectonic setting of plutons.

Structures in metamorphic rocks, Foliation, Axial plane foliation, transported foliation, other metamorphic foliation.

Lineation – problem of lineation indicating extension parallel to fold axis, small scale folds.

Structural association, salt domes, diapers, nappe, tectonic melanges

15 hours

Unit – IV

Plate tectonics – Sea floor spreading, island arcs, orogeny and epiorogeny. Geo-dynamics of Indian plate, evolution of Himalayas, Isostasy and Neotectonics.

15 hours

Reference Books

1. Structural and Tectonic principles - Badgley, P.C.
2. Mechanics in Structural geology, Bayly, B.
3. Structural geology – Billings M.P.
4. Structural geology of rocks and region – Davis G.R.
5. Understanding the Earth – Gass I.B., Peter J.Smith and Smith PGL
6. An outline of Structural geology
7. Global tectonics – Keary. P., and Vine F.J.
8. Modres. E., and Twiss., R.J.
9. Folding and fracturing of rocks : Ramsy, J.G.

25043 Paper III - Igneous and Metamorphic Petrology

Unit I

Introduction to Igneous Petrology – Formation of igneous rocks – Crystallization of unicomponent, Bicomponent and ternary magmas. Origin, composition and constitution of magmas – Bowen's reaction principle – Magmatic Differentiation – Fractional crystallization and assimilation.

15 hours

Unit II

Forms, structures and textures of igneous rocks. Classification of Igneous rocks. Petrography and petrogenesis of the following rock types: Lamprophyres, Carbonatites, Anorthosites, Granites, Granodiorites, Pegmatites, Syenites and Nepheline syenites. Gabbro, Dolerite, Basalt, and Picrite basalts.

15 hours

Unit III

Metamorphism, metamorphic processes, Agents of metamorphism, kinds of metamorphism, classification and nomenclature of metamorphic rocks, structures and textures of metamorphic rocks. **15 hours**

Unit IV

Grades and zones of metamorphism – Concept and types of metamorphic facies. Classification and description of Schist, Gneiss, Amphibolite, Quartzite, Marble, Slate, Phyllite – Origin and types of granulites -Charnockites and Khondalites. **15 hours**

Reference Books

1. Igneous and Metamorphic Petrology – Turner and Verhoogen
2. Petrology of Igneous and Metamorphic rocks – Hyndman
3. The petrography of Igneous and Metamorphic rocks in India – S.C.Chatterjee.
4. Metamorphic petrology- B. Bhaskara Rao

25044 Paper IV – Sedimentology and Marine Geology

Unit I

Sedimentology – Origin of Sedimentary of rocks. Structures and textures of Sedimentary rocks. Provenance, lithification and digenesis of Sedimentary rocks. **15 hours**

Unit II

Classification of sedimentary environments – Non-marine environments – Glacial, Aeolian, Lacustrine and Fluvial environments – Marine environments – Shelf and Deep sea sediments..

15 hours

Unit III

Classification and origin of Clastic and Non-clastic rocks. Clastic – Rudaceous , Arenaceous and argillaceous rocks. Non-Clastic – Chemical and Organic deposits. Descriptive study of Sedimentary rocks (Breccia, Conglomerate, Lime Stone, Sand Stone, Shale, Silt, Shell Lime Stone,etc.,) . **15 hours**

Unit IV

Introduction and scope of Marine Geology, Morphologic and tectonic domain of the ocean floor. Oceanic profile, origin of oceanic crust, ocean sediments, classification, Near shore Geological Processes, Beach placers, Carbon Compensation Depth (CCD) , Shelf deposit, deep ocean Poly Metallic Nodules (PMN) , Hydrocarbon deposits. Concept and causes of Sea level changes and measurements. Physical and chemical properties of sea water. Residence times. Coastal Pollution , Mitigation and Management- Coastal Erosion and Protection measures

15 hours

Reference Books

1. Sedimentary Rocks – Pettijohn, F.J.
2. Origin of Sedimentary Rocks – Blottt, H., Middleton, G. and Murray, R.
3. Introduction to Sedimentology – Sengupta, S.M.
4. An Introduction to Sedimentology – Shelly, R.C.
5. Shepard, Submarine geology
6. Krunen, Marine geology
7. King, Introduction to marine geology and geomorphology
8. Keen, Introduction to marine geology
9. James Kennet, Marine geology, 1982, prentice hall
10. Riley and Chester, Introduction to marine chemistry
11. James Drever, The geochemistry of natural waters

M.Sc. Geology Choice Based Credit System

25045 – Introduction to Earth Resources

Unit I

Introduction to Earth – Dynamics of Earth, the interior of the Earth – Rocks –Genesis and Types Igneous , Sedimentary and Metamorphic Rocks.

Unit II

Minerals – Definition – Mineralogy and description of Common Rock forming minerals – Industrial minerals – Cement industry, Glass industry, Ceramic industry, Fertilizer industry, Steel Industry.

Unit III

Fuel Minerals – Mineralogy, origin, distribution of Coal – Petroleum and Natural gas – Origin – Inorganic and organic theories – Reservoir rocks – Atomic minerals – Association, occurrence and distribution of Atomic minerals.

Unit IV

Water resources – Hydrological cycle – precipitation, runoff, infiltration and evapotranspiration, Subsurface and vertical distribution of groundwater – Occurrence of groundwater, classification of aquifers, springs and wells.

Reference Books

1. Introduction to Sedimentology – Sengupta, S.M.
2. The petrography of Igneous and Metamorphic rocks in India – S.C.Chatterjee.
3. Metamorphic Petrology- B. Bhaskara Rao
4 Economic Mineral Deposits – Bateman, A.M. and Jenson, M.C.
5 Indian Mineral Resources- Krishna Swamy

Practical I-
25041P- Petrology

Petrology: Megascopic identification of Igneous, Metamorphic and Sedimentary Rocks.
Microscopic examination of Rock thin sections.
Norm Calculations.

Practical II
25042P - Statistics, Computer Applications and Structural Geology

Creating of MS Word file, Creating worksheets and execution of formulae, creating Bar graphs, pie graphs in MS Excel, Creating Power Point presentations with animations.
Creating database and simple queries in Oracle
Calculation of standard deviation, mean, median, mode, correlation, regression, theoretical distribution, and analysis of one way variance.
Structural geology problems: Dip & Strike, 3 point problems, thickness problem and fault problems, Geological maps, Section drawing, contour mapping, suitability of structural area for engineering projects.

III SEMESTER

35041 Paper I – Economic Geology ,Mineral Economics & Gemology

Unit I

Process of formation of mineral deposits – magmatic, metasomatism, hydrothermal process, sedimentation, residual and mechanical concentration, oxidation supergene enrichment, sublimation, evaporation. Ore deposition – Physical and chemical controls of ore fluids and their migration.

Origin, occurrence and distribution of the Gold, Iron, Manganese, Chromite, Copper, Lead and Zinc, Aluminium and Magnesium deposits of India. **15 hours**

Unit II

Metallogenic epochs and provinces with special reference to India. Origin, occurrence and distribution of refractory, abrasive, glass, ceramic, cement and fertilizer minerals. Mineral wealth of Andhra Pradesh. **15 hours**

Unit III

Classification of Mineral deposits – Strategic, critical and essential minerals. National Mineral Policy. Mineral Concession Rules, Mineral conservation and substitution. Status of mineral production in India. Marine Mineral Resources, Law of Sea. **15 hours**

Unit.1V.

Introduction to Gems -Basic properties of Gems-Formation of Gems. Description of Gem species with respect to their varieties [color wise],chemical composition ,crystal system ,physical and optical properties, characteristic inclusions and occurrence, Corundum, Beryl,, Garnet, Feldspar, Tourmaline ,Topaz and Silica, Treatment of Gemstones and their detection, Gem synthesis and distinction between Synthetic and Natural Gemstones.

15 hours

Reference Books

1. Mining Geology – Arogya Swamy
2. Principles of Mineral dressing - Gaudin A.M.
3. Selected topics in Mineral dressing – Pradeep and Rakesh Kumar.
4. Hand Book on Mineral Dressing – H.G.Vijayendra.

35042 Paper II - Energy Resources

Unit I

Petroleum – Origin- inorganic and organic theories – migration and accumulation of oil and gas – Geological age of reservoir rocks – Classification of traps. Petroliferous basins of India. Geology of the productive oil fields of India. Status of Oil and Natural Gas in India- Gas Hydrates

15 hours

Unit II

Coal – Origin and classification – Chemical characterization – Proximate and ultimate analysis – Gelogical and Geographical distribution of coal deposits in India. Detailed Geology for important coal fields of India. **15 hours**

Unit III

Atomic minerals – Mode of occurrence and association with other radioactive minerals. Methods of prospecting and productive geological horizons in India. Detailed Geology and Distribution of Uranium deposits in India. Atomic fuels and environment.

15 hours

Unit IV

Renewable Energy resources – Wind, Solar, Hydral and Geothermal **15 hours**

Reference Books

1. All you wanted to know about Disasters – (Brig) H.K.Kanna
2. Petroleum formations and occurrences – Tissort, B.P. and Welte D.H.,
3. Text book of coal – Chandra, D.
4. Uranium ore deposits – Dahlkamp F.J.
5. Petroleum Geology – Laverson, P.
6. Renewable Energy Resources and Emerging Technologies – Kothari, D.P., Singal, K.C. and Rakesh Ranjan
7. Renewable Energy Resources – John Twidell and Tony Weir

35043 Paper III – Remote Sensing and GIS

Unit I

Aerial Photography – Basic information and specifications – Aerial cameras – Optical aspects of aerial cameras – Planning and execution of photographic flights – Factors affecting image quality – Technique of Aerial Photo/image interpretation

Satellite Remote Sensing – Basic concepts – Electro Magnetic Radiation, Electromagnetic spectrum – Interaction of electromagnetic radiation with atmosphere, Interaction of electromagnetic radiation with Earth surface – Atmospheric widows – Spectral regions useful for Remote Sensing. **15 hours**

Unit II

Satellite data acquisition systems – Platforms – Airborne and Space borne – Sensors – Passive sensors – Multispectral scanners – Thermal infrared scanner – Microwave, radiowave scanners - Active sensors – Laser scanner, Radar altimeter and image Radar

Multispectral Remote Sensing – Resolutions – Spectral, Spatial, Radiometric and temporal – Remote Sensing in Thermal Infra Red regions – Basic concepts and characteristics – Geological interpretations and Advantages of thermal imagery – Remote Sensing in Microwave region – Basic concepts, characteristics, advantages and disadvantages. **15 hours**

Unit III

Digital Image Processing – Introduction, Basic concepts – Image formats and its characteristics – Image pre processing – Introduction, radiometric errors, geometric errors – Map projections – Geometric rectification, georeferencing and image to image registration.

Image enhancement – Radiometric enhancement – Spatial enhancement – Spectral enhancement – Image classification – Supervised classification, Unsupervised classification – Pattern of recognition and feature extraction – Image mosaiking and change detection. **15 hours**

Unit IV

Geographical Information System (GIS) – Introduction – Components of GIS – Data structures in GIS – Raster and Vector Data Structures – Types of data – Points, lines and polygons – Data conversion – Raster to vector and vector to raster.

Data input, verification, storage and output – Data Input process and devises – Spatial and non-spatial data entering – Data verification – Storage – Data output processes and devices – Digital elevation modeling – Products and usefulness of DEM/DTM – Introduction to GPS **15 hours**

Reference Books

1. Remote Sensing Principles and interpretations – Sabins, F.F.Jr.
2. Remote Sensing and Image Interpretation - Lillisand, T.., and Kiefer, P.W.
3. Remote Sensing Geology – R.P. Gupta.
4. Principles of Geographical Information Systems for Land Resources – Borough, P.A.
5. Geographical Information Systems – Kang Tsung Chang.

35044 Paper IV – Geochemistry

Unit I

Introduction to geochemistry – its scope. The earth in relation to the solar system and the Universe. Cosmic abundance of elements, composition of planets and meteorites. Structure composition and distribution of elements in the Earth. Geochemical classification of elements. Geochemistry of hydrosphere, biosphere and atmosphere. **15 hours**

Unit II

Elementary crystal chemistry and thermodynamics. Lattice energy of crystals, principles of ionic substitution in minerals. Ionization potential, electro negativity, Pauling's rule, Periodic Table with special reference to Rare Earth Elements (REE). Geochemistry of Uranium & Lithium**.**

15 hours

Unit III

Introduction to isotope geochemistry, stable isotopes, geochemistry of carbon, oxygen, sulfur Isotopes, Radiogenic Isotopes, Decay scheme of K-Ar, U-Pb and Rb-Sr, Carbon dating and its applications to Geology. **15 hours**

Unit IV

Geochemical prospecting; Fundamental concepts, pathfinder elements. Threshold values, geochemical anomaly. Primary and secondary dispersion Halos sampling. Geochemical cycles and geochemical methods for prospecting of metallic minerals, petroleum and natural gas. Techniques in Geobotanical survey. **15 hours**

Reference books

1. Introduction to Geochemistry – Mason, B. and Mooro
2. Introduction to Geochemistry – Krankopf, K.B.
3. Principles of Isotope Geology – Faure, G.
4. Introduction to Crystal Chemistry - Evans, R.C.
5. Geochemistry- Arthur H. Brownlow.

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35045 – Essentials of Remote Sensing and GIS Fundamentals

Unit I

Introduction of Remote Sensing – Types of sensors and scanners – Satellite data acquisition systems – Platforms – Airborne an Space borne sensors – Passive and Active sensors – Digital Image Processing – Introduction and Basic concepts.

Unit II

Geographical Information System (GIS) – Introduction – Components of GIS – Data structures in GIS – Raster and Vector data structures – Types of data – Points, lines and Polygons – Data conversion – Raster to Vector and vector to raster.

Unit III

Stages of Mineral Exploration – Methods of choosing target area – Criteria for accepting or rejectin the target area – Guides to ore search – straigraphic, lithological, geomorphological, structural guides, Rock alteration and Geobotanical guides in mineral exploration.

Unit IV

Remote Sensing Applications in Environment Assessment– Visual interpretation of satellite image for forest cover mapping, Density assessment – Google maps.

Reference Books

1.Remote Sensing Principles and interpretations – Sabins, F.F.Jr.
2.Remote Sensing and Image Interpretation - Lillisand, T.., and Kiefer, P.W.
3.Remote Sensing Geology – R.P. Gupta.
4. Indian Mineral Resources- Krishna Swamy

Practical I
35041P Remote Sensing and GIS

Visual Interpretation of Satellite Image
Digital Image Processing
GIS: Spatial data creation and spatial data conversion, scanning and screen digitization.
Georeferencing, Projection systems, Projection and transformation

Practical II
35042P Geochemistry

Chemicals, Reagents and solutions, Expressing the concentration of solution, percent concentration.
Calculation of Equivalent Weight, Diluting Solutions, Standardization of common standard solutions, Common Laboratory Techniques for Environmental sampling analysis.
Distillation, Gravimetric, Titrimetric, Potentiometry & Ion selective electrode
Calculation of Oxidation Number, Balancing weathering equations, checking the accuracy of Analytical results, Diagrammatic representation of geochemical date.

IV SEMESTER

45041 Paper I –Mineral Exploration, Mining and Ore Beneficiation

Unit I

Stages of Mineral exploration – Methods of choosing target area – Criteria for accepting or rejecting the target area – Guides to ore search – Stratigraphic, Lithological, Geomorphological and Structural. Rock alteration and Geo-botanical .Sampling and Drilling Methods. Detailed study of Geophysical methods of Exploration and Geochemical prospecting.

15 hours

Unit II

Remote Sensing Applications in various stages of mineral exploration – Spectral characteristics of alteration minerals – Hydroxyl bearing minerals, Carbon and tectosilicates and colour ratio images using digital image processing. Application of Remote Sensing in exploration of Gold, Base metals (Copper, Lead, Zinc), Diamond, Bauxite, Iron ore and barite.

15 hours

Unit III

Mining methods – Alluvial, Opencast mining and Underground methods. Mine supports, Subsidence, Methods of breaking of rocks, Mine atmosphere, Ventilation, Drainage, Pumping, Haulage and Winding. Mining hazards and safety measures. Preparation of Mine plans.

15 hours

Unit IV

Ore dressing and its importance, properties of minerals and rocks and their consideration in ore dressing techniques. Basic ore dressing operations – Crushing, Grinding, Sizing, Screening and classifiers. Heavy fluid separation – Zigging and tabling. Concentration process – Magnetic and electro static separation, Gravity concentration, froth flotation, Amalgamation and Agglomeration. Dressing of the following ores – Sulphide ores – Tin, Lead, Zinc, Native metals – Gold, Non-sulphide ores – Uranium, Baryte and Coal.

15 hours

Reference Books

1. Mining Geology – Arogyaswamy
2. Mining Geology – McKinstry
3. Ore Deposits of India – G.K.Gokhale.
4. Introduction to Geophysical prospecting – Dobrin, M.B.
5. Introduction to Exploration Geochemistry – Levinson, A.S.
6. Image Interpretation in Geology – Drury, S.A.
7. Remote Sensing Principles and Interpretation – Sabins, F.F.

45042 Paper II – Hydrogeology and Watershed Management

Unit I

Origin of water – Mateoric Juvenile, magmatic and sea waters – Hydrologic cycle – Precipitation, Runoff, infiltration and evapotrapspiration, Subsurface movement and vertical distribution of groundwater, Springs, Classification of aquifers. Occurrence of groundwater, Rocks affecting groundwater occurrence ,Hydrological properties of rocks – Specific Yield, Specific Retention, Porosity, Hydraulic conductivity, transmissivity, Storage Coefficient, Hydrographs.

15 hours

Unit II

Ground water movement, Darcy's law and its applications, determination of permeability in laboratory and in field, Estimation of Groundwater Budget,,Groundwater Quality – Physical & Chemical properties of water, Quality criteria for different uses, graphical presentation of water quality data ,

15 hours

Unit.111

Surface geophysical methods – Seismic, Gravity, Geoelectrical and Magnetic, Subsurface geophysical methods – Artificial recharge of groundwater. Exploration of Ground water using Remote Sensing data. Application of Remote Sensing Data in selection of groundwater in hard rock terrain and unconsolidated sediments. Groundwater indicators

15 hours

Unit.1V

Watershed-Definition, Scope, Characteristics and classification ,Derivation of Aquifer parameters, Groundwater recharge and its estimation. Watershed management, Soil conservation sites for water harvesting structures- Socio-Economic impact of Watersheds

. **15 hours**

Reference Books

1. Groundwater Hydrology – Todd, D.K.
2. Applied Hydrogeology – Fetter C.W.
3. Groundwater Assessment and Development and Management – Karanth, K.R.
4. Remote Sensingg and Interpretation – Lives and Kaifer
5. Remote Sensing in Hydrology – Enggmann
6. Remote Sensing Geology – Gupta, R.P.,
7. Hydrology and watershed Management,J NTU by B.Venkateswara Rao,G.Jagan Mohan Das,C..Sarala and M.V.S.S.Giridhar

45043 Paper III – Engineering Geology and Natural Hazards

Unit I

Engineering properties of rocks, soils - 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, Quarrying.

15 hours

Unit II

Definition and parts of dam, types of dams, geotechnical consideration in selection of dam sites, case histories – Nagarjuna Sagar Dam and Srisailam Dam, Characters for investigating relative suitability, geological consideration for reservoir sites.

Types of tunnels, objects for 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.

15 hours

Unit III

Fundamental concepts of disaster management – Hazard, Disaster, Risk, Vulnerability management, Disaster management policy, National Disaster Framework – Floods, Cyclones and Tsunamis, nature, prediction and mitigation of volcanic hazards, Classification, causes& controls of landslides, subsidence and its importance. **15hours**

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 locations (highway and railroads) canal and pipeline alignment, tunnels constructions. Site suitability evaluation (lithological, structural, geomorphological, slope, gradient, economic considerations. **15 hours**

Reference Books

1. Engineering materials – S.C. Rangwala
2. Text Book of Engineering Geology – N.Chennakesavulu.
3. Principles of Engineering Geology and Geotectonics – D.P.
4. Engineering Geology – B.S.Satyanarayana Swamy
5. Principles of Engineering Geology – K.V.G.K.Gokhale
6. Remote Sensing and Image Interpretation – Lillisand, T.M., Keifer, R.W.
7. Remote Sensing Principles and Interpretations – Sabins, F.F.

45044 Paper IV – Environmental Geology

Unit I

Scope and Development of environmental geology- Renewable and non-renewable resources- land desertification and land degradation and land management, Deforestation, Afforestation. Soil Profile, origin of soils, Classification of Soils, Soil types of India, Soil conservation.

15 hours

Unit II

Environmental degradation due to irrigation, use of fertilizers and pesticides - Urbanization and associated impact on environment. Consumption of fossil fuels and its effect on environment. Green house effect and Global warming and related problems.

15 hours

Unit III

Environmental management in mining – Impact of mining activities on the environment, erosion, causes and control. Man made hazards like multipurpose dams, power projects, heavy engineering constructions and its impacts. Water contamination- Waste disposal.

15 hours

Unit IV

Spectral characteristics of soil. Impact assessment of anthropogenic activities such as urbanization, open cast mining and quarrying, river-valley projects, disposal of industrial and radio-active waste, dumping of ores, mine waste and fly-ash. Environmental abatement - legislative measures in India .

15 hours

Reference Books

1. Environmental Geology – Indian context – K.S.Valdiya
2. Environmental Geology – Flawn, P.T.
3. Environmental Geology – Keller, E.A.
4. Application of Remote Sensing in Agriculture – Steven, M.D., and Clark, J.A.
5. Environmental Science and Technology – Stanley E. Manahan.

Practical I
45041P Geoinformatics Applications

Mineral Exploration using Remote Sensing and GIS
Watershed Management using Remote Sensing and GIS
Site selection for Dams & Reservoirs, Tunnel alignment and Transportation network suing Remote Sensing and GIS
Land use and Land cover mapping using Remote Sensing and GIS
Study of maps of seismic zones, earthquake-prone, and landslide-prone areas in India using Remote Sensing and GIS.

Practical II

Project Work and Viva