

M.Sc. Geology Revised Syllabus March 2015

Code	Paper	Title	Hours per Week	No. of Credits
<u>I Semester</u>				
15041	Paper I	Geomorphology and Atmospheric Science	4	4
15042	Paper II	Crystallography, Mineralogy & Optical Mineralogy	4	4
15043	Paper III	Palaeontology & Stratigraphy	4	4
15044	Paper IV	Indian Geology & Field Geology	4	4
15041P	Practical I	Crystallography, Mineralogy and Optical mineralogy	4	4
15042P	Practical II	Stratigraphy, Palaeontology, Field Report	4	4
<u>II Semester</u>				
25041	Paper I	Statistics & Computer Applications	4	4
25042	Paper II	Structural Geology & Geotectonics	4	4
25043	Paper III	Igneous & Metamorphic Petrology	4	4
25044	Paper IV	Sedimentology and Marine Geology	4	4
25041P	Practical I	Petrology	4	4
25042P	Practical II	Statistics, Computer Applications and Structural Geology	4	4
25045	Non-Core-1 (CBCS)	Introduction to Earth Resources	4	4
<u>III Semester</u>				
35041	Paper I	Economic Geology & Mineral Economics	4	4
35042	Paper II	Energy Resources	4	4
35043	Paper III	Remote Sensing & GIS	4	4
35044	Paper IV	Geochemistry	4	4
35041P	Practical I	Economic Minerals and Geochemistry	4	4
35042P	Practical II	Remote Sensing & GIS	4	4
35045	Non-Core-2 (CBCS)	Application of Remote Sensing and GIS for Natural Resources.	4	4
<u>IV Semester</u>				
45041	Paper I	Mineral Exploration, Mining and Ore beneficiation	4	4
45042	Paper II	Hydrogeology & Water Shed management	4	4
45043	Paper III	Engineering Geology & Natural Hazards	4	4
45044	Paper IV	Environmental Geology	4	4
45041P	Practical I	Geoinformatic Applications in Mineral Exploration, Hydrogeology, Engineering and Environmental Geology.	4	4
45041T	Practical II	Project Work	4	4
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 Science

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.

15 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, Industry.

15 hours

Reference Books

1. Essentials of Geology by Stanley Chermicoff, Hayden A. Chip Fox. Ramesh Venkatakrisnansn.
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
9. Atmosphere, Weather & Climate – K.Siddartha.
10. Climatology – D.S.Lal
11. Atmosphere, Weather & Climate – R.G.Barm.

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 following mineral groups: Quartz, Feldspars and Feldspathoids, Zeolites.

15 hours

Unit III

Physical, chemical and optical characters and mode of occurrence of the following groups and minerals of olivine, pyroxene, amphibole, mica Garnet, Alumino silicates.

15 hours

Unit IV

Principles of optics, Polarizing microscope, Refrindex, 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.Kerr
5. Mineral Optics by Philips W.R.
6. Elements of Optical Mineralogy by Winchell A.N.

15043 Paper III - Palaeontology 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 Micropalaeontology – Detailed morphology of Foraminifera, Ostracoda – Utility of microfossils in oil exploration – Palaeoecology, Palaeobotany – 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 history of Vertebrates – Core studies of Horse, Elephant, 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. Invertebrate Palaeontology – Henry Woods
2. Principles of Invertebrate Palaeontology – Shorrock & Twendhofel
3. Elements of Micropalaeontology – Bignot. G.
4. Principles of Micropalaeontology – F.H.Glessener
5. Vertebrate Palaeontology – Henry Woods.
6. Principles of Stratigraphy – Lemon, R.R.
7. Principles of Sedimentology and Stratigraphy – Boggs, S.
8. Principles of Stratigraphy – Danbar, C.O., and Rodgers, J.

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 Archaean, Cuddapah and Vindhyan Supergroups and their equivalents.

15 hours

Unit II

Gondwana Supergroup – Classification, Structure. Fossil content of Triassic, Jurassic, Cretaceous formations of India. Short account of Sivaliks and Deccan Traps – Intra and Inter trappeans – 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 trap. 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.

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

Practical I
15041P Crystallography, Mineralogy and Optical Mineralogy

Crystallography: Identification of crystal models of 32 crystal classes and their crystals.
Mineralogy: Megascope identification of minerals
Microscopic identification of mineral thin sections.

Practical II
15042P Stratigraphy, Palaeontology, Field Geology

Stratigraphy: Stratigraphy problems
Palaeontology: Megascope identification of fossils
Microscopic identification of microfossils.
Submission of field report

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 – Dager 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 statistics – 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 – Behavior of materials - Factors controlling the behavior of rock materials

15 hours

Unit – II

Geometric classification of Folds: Mechanics of folding and buckling, geometry of superimposed folding, folding in shield zones, fold systems. Joints Classification and their importance in Construction projects. Mechanics of faulting. Classification and recognition of faults. Strike slip faults, normal faults. Unconformities and basement cover relations.

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, diapirs, nappe, tectonic melanges

15 hours

Unit – IV

Plate tectonics – Dynamic evolution of continental and oceanic crust. 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

Form, structures and textures of igneous rocks. Classification of Igneous rocks. Petrography and petrogenesis of Lamprophyres, Carbonatites, Anorthosites, Granite, Granodiorite, Pegmatite, Rhyolite, Syenite, Gabbro, Dolerite, Basalt, and Picrite igneous rocks.

15 hours

Unit III

Metamorphism, metamorphic processes, Agents and 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, Amphibolites, 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.

25044 Paper IV – Sedimentology and Marine Geology

Unit I

Sedimentology – Origin of Sedimentary of rocks. Structures and textures of Sedimentary rocks. Provenance, lithification and diagenesis of Sedimentary rocks.

15 hours

Unit II

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

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.

15 hours

Unit IV

Introduction and scope of marine geology, morphologic and tectonic domain of the ocean floor.

Oceanic profile, oceanic features, origin of oceanic crust, ocean sediments, classification, ocean tectonics. Classification of marine mineral deposits, origin and depositional system of marine resources. Beach placers, Shelf deposit, deep ocean phosphatic, polymetallic nodules, sulphate deposits, hydrocarbon deposits. Concept and causes of sea level changes and measurements. Physical and chemical properties of sea water. Residence times. 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

Practical I
25041P Petrology

Petrology: Megascopic identification of Igneous rocks, Metamorphic Rocks 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 bargraphs, 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 and Mineral Economics

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.

15 hours

Unit II

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

15 hours

Unit III

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 IV

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

Reference Books

1. Mining geology – Arogyaswamy
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. Position of oil and natural gas in India.

15 hours

Unit II

Coal – Origin and classification – Chemical characterization – Proximate and ultimate analysis – Geological 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. Geographical distribution of Uranium deposits in India. Atomic fuels and environment.

15 hours

Unit IV

Renewable Energy resources – Wind, Solar, Hydro, Geothermal

15 hours

Reference Books

1. Petroleum formations and occurrences – Tissot, B.P. and Welte D.H.,
2. Text book of coal – Chandra, D.
3. Uranium ore deposits – Dahlkamp F.J.
4. Petroleum Geology – Laverson, P.

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 windows – 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 devices – 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. 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.

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 data.

IV SEMESTER

45041 Paper I –Mineral Exploration, Mining and Orebeneficiation

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, Structural, Rock alteration and Geo-botanical. 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, Basemetals (Copper, Lead, Zinc), Dimond, Bauxite, Iron 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. Sampling methods, Drilling methods. 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 metao – 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 Inerpretation – Sabins, F.F.

45042 Paper II – Hydrogeology and Watershed management

Unit I

Origin of water – Meteoric Juvenile, magmatic and sea waters – Hydrologic cycle – Precipitation, Runoff, infiltration and evapotranspiration, Subsurface movement and vertical distribution of groundwater, Springs, Classification of aquifers. Occurrence of groundwater, Rocks affecting groundwater occurrence - Unconsolidated sediments and hard rock terrain – 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, Well Hydraulics – Types of wells, drilling methods, Estimation of Groundwater Budget, Basin Yield,

15 hours

Unit III

Groundwater Quality – Physical & Chemical properties of water, Quality criteria for different uses, graphical presentation of water quality data problem, Saline water intrusion in coastal and other aquifers and its prevention. Surface geophysical methods – Seismic, Gravity, Geoelectrical and Magnetic, Subsurface geophysical methods – Artificial recharge of groundwater.

15 hours

Unit IV

Exploration of Groundwater using Remote Sensing data. Application of Remote Sensing Data in selection of groundwater in hard rock terrain and unconsolidated sediments. Watershed management.

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 Sensing and Interpretation – Lives and Kaifer
5. Remote Sensing in Hydrology – Enggmann
6. Remote Sensing Geology – Gupta, R.P.,

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, modulus of elasticity, modulus 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 Srisailem 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, Causes of Floods, Floods hazards in India, Cyclones and their genesis, Tsunamis and dimensions of hazards. Volcanic hazards, volcanic belt girdling in India sub-continent, origin and types of volcanic activity, nature of volcanic hazards, Prediction of volcanic eruptions, Mitigation of volcanic hazards. Classification, causes of landslides, controls of landslides subsidence and its importance, site selection for ghat roads. Determination of causative factors for soil erosion, Soil conservative measures.

15 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 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.Gokhele
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.Valdia
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 using Remote Sensing and GIS

Land use and Land cover mapping using Remote Sensing and GIS

Practical II

Project Work and Viva