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### B.Sc. Geology: Syllabus (CBCS)

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### B.Sc. Geology: Syllabus (CBCS)

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**Total credits for the entire program: 140**

**Total marks for the entire program: 4100**
I. LIST OF LANGUAGES COURSES
   : Paper-1 Tamil/Other Languages
   : Paper-2 Tamil/Other Languages
   : Paper-3 Tamil/Other Languages
   : Paper-4 Tamil/Other Languages

II. LIST OF FOUNDATION COURSES
   : Paper-1 English
   : Paper-2 English
   : Paper-3 English
   : Paper-4 English

III. LIST OF CORE COURSES
   : Paper-1 Geomorphology
   : Paper-2 Palaeontology
   : Paper-3 Structural Geology
   : Paper-4 Stratigraphy
   : Paper-5 Crystallography
   : Paper-6 Mineralogy
   : Paper-7 Economic Geology
   : Paper-8 Igneous Petrology
   : Paper-9 Sedimentary and Metamorphic Petrology
   : Paper-10 Hydrogeology

IV. LIST OF CORE PRACTICALS
   : Practical-1 Palaeontology
   : Practical-2 Structural Geology and Surveying
   : Practical-3 Crystallography and Mineralogy
   : Practical-4 Petrology and Economic Geology

V. LIST OF ALLIED THEORY SUBJECTS
   : Paper-1 Chemistry
   : Paper-2 Chemistry
   : Paper-1 Physics
   : Paper-2 Physics

VI. LIST OF ALLIED PRACTICALS
   : Practical-1 Chemistry
   : Practical-2 Physics

VII. LIST OF SKILL BASED SUBJECT
   : Paper-1 Engineering Geology
   : Paper-2 Remote Sensing
   : Paper-3 Gemology
   : Paper-4 Mineral Exploration

VIII. LIST OF ELECTIVES COURSES
   : Paper-1 Mining Geology
   : Paper-2 Geographical Information System
   : Paper-3 Marine Geology
IX. LIST OF NON-MAJOR ELECTIVES COURSES

- Paper-1 Disaster Management
- Paper-2 Environmental Geology

X. LIST OF COMPULSARY COURSES

- Environmental Studies
- Value Education
- Extension Activities

Question Paper Pattern

Time: 3 Hours
Max Marks: 75

Part-A (10X2=20 Marks)
Answer all the questions
Each Answer shall be in about 30 words.

Part-B (5X5=25 Marks)
Answer all the questions with internal choice
Each Answer shall be in about 300 words.

Part-B (3X10=30 Marks)
Answer any three out of five
Each Answer shall be in about 1000 words.
Objective:
To familiarise about the basic principles of Geology, Evolution of geomorphic concepts, tectonics, Erosional and Depositional landforms, Earth’s various exogenetic processes like weathering and action of geological agents and Endogenetic processes like earthquake, volcanoes, tectonic process and mountains.

Unit I

Unit II

Unit III

Unit IV
Unit V

TEXT / REFERENCES BOOKS

ALLIED – 1

CHEMISTRY – I

OBJECTIVE:

- Basic knowledge on Metallurgy, Cycloalkanes, Polarising Effects, Stereochemistry, Chemical Kinetics, Catalysis, Photochemistry, VSEPR Theory, Fuels, Osmosis, Nuclear Chemistry, Petroleum Chemistry, Chemistry of Naphthalene, Conductors and Applications wherever necessary are to be taught for I- Semester.

UNIT – I


1.2 Calcination, Smelting, Roasting, Fux, Slag - Definition - Reduction methods - Goldschmidt Aluminothermic process and Carbon Reduction method - Refining of Metals - Electrolytic, Van Arkel and Zone Refining.

1.3 Ores of Titanium and Cobalt - Extraction of Titanium and Cobalt.

UNIT – II

2.1 Cycloalkanes - Preparation – Wurtz reaction and Dieckmann’s condensation - Properties of Cycloalkanes – Substitution and Ring opening reactions.

2.2 Polarisation - Inductive effect, Mesomeric effect and Steric effect (Acid and Base Strength).


UNIT – III

3.1 Chemical Kinetics – Rate of a reaction – Definition of Order and Molecularity – Distinction between Order and Molecularity - Derivation of First order rate equation - Half Life Period of first order reaction.
3.2 Catalysis - Catalyst - Autocatalyst - Enzyme catalyst - Promoters - Catalytic poisons – Active Centre - Differences between Homogeneous and Heterogeneous Catalysis - Industrial Applications of Catalysts.


UNIT – IV
4.1 VSEPR Theory – Hybridisation and Shapes of simple molecules BF$_3$, PCl$_5$, SF$_6$ and XeF$_6$.


4.3 Osmosis - Osmotic pressure - Reverse osmosis – Definition - Desalination of Sea water.

UNIT – V
5.1 Nuclear Chemistry – Atomic number, Mass number - Isotopes, Isobars and Isotones – Definition and Examples - Definition of Half life period - Nuclear Binding Energy, Mass Defect and N/P ratio - Nuclear Fission and Nuclear Fusion (Elementary idea) - Applications of Radioisotopes in Medicine, Agriculture and Industries – Carbon Dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking – Naphthalene – Preparation – Haworth’s method – Properties – Oxidation, Reduction and Uses of Naphthalene - Structure of Naphthalene (Structural elucidation not necessary).

5.3 Conductors, Insulators, Semiconductors, N- and P- Type Semiconductors – Definitions and Examples.
Objective:
To study about the Palaeo life in the world, Habitats of animals, indicators of evolution and migration of life forms, General morphology and classification of fossil belonging to phylum Arthropoda, Mollusca, Brachiopoda, protozoa, plant fossils and Applications of Micro palaeontology

Unit I

Unit II

Unit III

Unit IV
Phylum Brachiopoda:- General morphology – Brachial skeleton – morphometric details, ornamentation, classification, geological history. Phylum Echinodermata: Class Echinoidea: General morphology, corona (Ambulacra, inter

Unit V


TEXT BOOKS

Netherlands

REFERENCE BOOKS

CORE PRACTICAL I
PALAEONTOLOGY

Megascopic identification and description of the following fossils:
- Corals: Calceola, Zaphrenitis, Favosites, Halysites;

MICRO FOSSILS:
Lagena, Nodosaria, Textularia, Operculina, Elphidium, Ammonia.

DIAGRAMS:
Paradoxides, Pentremites, Trigonia, Arca, Meretrix, Murex, Turritella, Nautilus, Spirifer.
ALLIED
CHEMISTRY – II

OBJECTIVE:

- Basic knowledge on Coordination Chemistry, Industrial Chemistry, Carbohydrates, Aminoacids, Proteins, Electrochemistry, Paints and Pigments, dyes, Vitamins, Medicinal Chemistry, Corrosion and Applications wherever necessary are to be taught for II- semester.

UNIT – I

1.1 Coordination Chemistry - Nomenclature of Coordination Compounds - Ligands, Central Metal Ion and Complex Ion – Definition and Examples – Coordination Number - Werner’s Theory of Coordination Compounds - Chelates - Functions and Structure of Haemoglobin and Chlorophyll.

1.2 Industrial Chemistry - Fertilisers and Manures – Biofertilisers - Organic Manures and their importance - Role of NPK in plants - Preparation and Uses of Urea, Ammonium Nitrate, Potassium Nitrate and Super Phosphate of Lime.

1.3 Contents in Match Sticks and Match Box - Industrial making of Safety Matches – Preparation and Uses of Chloroform, DDT, Gammexane and Freons.

UNIT – II

2.1 Carbohydrates - Definition and Examples - Classification – Oxidation and Reduction Reactions of Glucose - Structure of Glucose (Structural elucidation not necessary) - Uses of Starch - Uses of Cellulose Nitrate and Cellulose Acetate.


2.3 Proteins – Definition - Classification of Proteins based on Physical properties and Biological functions - Primary and Secondary Structure of Proteins (Elementary Treatment only) – Composition of RNA and DNA and their Biological role - Tanning of Leather - Alum (Aluminum chloride tanning ) - Vegetable tanning – Chrome Tanning.

UNIT – III

3.1 Electrochemistry - Electrolytes – Definition and Examples – Classification - Specific and Equivalent Conductance - their determination – Variation of Specific and Equivalent conductance with Dilution – Ostwald’s Dilution Law and its Limitations.
3.2 Kohlrausch’s Law - Determination of Dissociation Constant of weak Electrolytes using Conductance measurement - Conductometric titrations.

3.3 pH – Definition and pH determination by indicator method - Buffer solutions - Buffer action - Importance of buffers in the living systems.

UNIT – IV


4.3 Chromatography - Principles and Applications of Column and Paper chromatography- \( R_f \) value.

UNIT – V

5.1 Drugs - Sulpha Drugs – Preparation and Uses of Sulphapyridine and Sulphadiazine - Mode of Action of Sulpha Drugs - Antibiotics - Uses of Penicillin, Chloramphenicol and Streptomycin - Drug Abuse and Their Implication - Alcohol – LSD.

5.2 Anaesthetics - General and Local Anaesthetics - Antiseptics - Examples and their Applications - Definition and One Example each for Analgesics, Antipyretics, Tranquilizers, Sedatives - Causes, Symptoms and Treatment of Diabetes, Cancer and AIDS.

5.3 Electrochemical Corrosion and its Prevention – Electroplating – Applications.
ALLIED PRACTICAL – 1
CHEMISTRY

VOLUMETRIC ANALYSIS

2. Estimation of Borax - Standard Sodium Carbonate.
4. Estimation of FeSO₄ – Standard FAS.
8. Estimation of Fe²⁺ using Diphenylamine / N- Phenyl Anthranilic acid as indicator.

ORGANIC ANALYSIS


Reactions of Aromatic Aldehyde, Carbohydrates, Mono and Dicarboxylic acids, Phenol, Aromatic Primary Amine, Amide and Diamide.

REFERENCE BOOKS

SEMESTER III
PAPER - 3
STRUCTURAL GEOLOGY

Objective:
To know about the Topographic, Geological maps and its applications, Primary and secondary structures, geometry and elements of fold, fault and joint surface recognition in the field, Foliation Mechanism and Uses of compass in field.

Unit I

Unit II

Unit III
Folds – geometry and elements of folded surface – classification – descriptive study of different types of folds – recognition of folds in the field and on map. Unconformities – definition – types – significance – recognition in the field and on map – over lap and off lap; Inlier and Outlier.

Unit IV

Unit V
Foliation – Primary and secondary foliations; Cleavage and Schistosity – Types and Origin of Rock Cleavages. Lineation – Kinds and Origin of lineation; Mechanism and Uses of Clinometer and Brunton compass, GPS and their uses in geological mapping.
**TEXT BOOKS**


**REFERENCE BOOKS**

1. V.V. Belousov-Structural Geology, Moscow
4. Park, P.G.-Fundamentals of structural Geology, John Willey & sons,
UNIT – I: PROPERTIES OF MATTER


Surface Tension: Surface Tension – Surface Tension and interfacial surface tension by the method of drops.

UNIT – II: HEAT


UNIT – III: ELECTRICITY AND MAGNETISM


UNIT – IV: SOUND AND ACOUSTICS OF BUILDING


Ultrasonics – Production by Piezo – electric method – properties and uses.

Acoustics of buildings: Reverberation – Reverberation time – Sabine’s formula (definition only) – Sound absorption co-efficient of surface – conditions for the perfect acoustics.
UNIT – V: OPTICS

Interference: Air Wedge – Description – Test for optical flatness of glass plate – Determination of diameter of a thin wire by air wedge.


Fibre optics: principle-classification of optical fibres-fibre optic communication system block diagram.

Books for Study & Reference

2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
SKILL BASED SUBJECT
PAPER – 1
ENGINEERING GEOLOGY

Objective:
To familiarise about the scope of Engineering Geology, properties of rocks, selection of reservoir sites, Tunnels and Foundation of geological investigations, and ground water problems.

Unit I

Unit II
Dams: definition, types, geological conditions, and site investigations. Short note on dam foundations and geological conditions. Outline of important Indian Dams.

Unit III
Reservoirs: definition, selection of reservoir sites, and groundwater conditions. Problems in reservoirs: sedimentation, slope control, leakage and seismicity. Short account of Indian reservoirs.

Unit IV
Tunnels: definition, parts of a tunnel, types, tunnelling in hard and soft rocks, geological investigations, and groundwater conditions.

Unit V
Foundations: definition, geological investigations, and ground water problems. Outline of support structures: rods, bolts, anchors, arches, rings, linings, and retaining walls.
REFERENCES AND TEXT BOOKS

NON-MAJOR ELECTIVE
PAPER - 1
DISASTER MANAGEMENT

**Objective:**
To understand about Natural disasters, monitoring and disaster management measures for Earthquake, Landslide, Volcanoes and Tsunamis

**Unit I**

**Unit II**

**Unit III**

**Unit IV**

**Unit V**
REFERENCE AND TEXTBOOKS

Objective:

To know about the Principles of stratigraphy in Geological record of India, economic importance of Cuddapah, Vindhyan, Gondwana and Tiruchirapalli formations.

Unit I

Unit II

Unit III
Paleozoic Stratigraphy: Distribution of Paleozoic rocks in India, Cambrian of Salt Range, Age of Saline Series, Upper Carboniferous and Permian rocks of Salt Range, Paleozoic rocks of Kashmir Valley, Paleozoic rocks of Spiti Valley, Paleozoic rocks of Peninsular India.

Unit IV
Unit V
Cenozoic Stratigraphy: Comprehensive account of the geological events took place during Cenozoic era in India, rise of Himalayas, stratigraphy of Siwalik system, fauna and flora of Siwaliks, Tertiary rocks of Assam, Karewa formation, Tertiary rocks of Tamilnadu, Tertiary rocks of Kerala, Pleistocene Glaciation - Mineral wealth of Tertiary rocks of India:

TEXTBOOKS

2. Wadia D.N. (1953)– Geology of India, TATA McGraw – Hill.
3. Ravindrakumar K.R.- Stratigraphy of India.

REFERENCE BOOKS

CORE PRACTICAL-2
STUCTURAL GEOLOGY AND SURVEYING

Structural Geology:
Contour maps and their interpretation. Exercises to predict trends of the outcrop of Horizontal, vertical an incline beds with respect to topography – reading of solid conformable maps – deciphering dip and strike of outcrops – construction of map when three points over a bedding plane are given construction of vertical sections order of super – position – vertical thickness of formations.

Reading of solid fold and fault maps construction of vertical sections – Determination of throw of vertical faults. Reading of unconformable solid maps – construction of sections. Reading of solid maps of areas when more than one structure is involved – determination of comparative ages of structures ad intrusions – geological history.

Structural Problems – problems relating to true dip and apparent dip; Determination of vertical and true thickness.

Description of features in Survey of India’s (SOI) toposheet: Extramarginal, marginal, intramarginal information, major conventional signs and symbols, physical and socio-cultural features

SURVEYING
Chain survey – prismatic compass survey – plane table survey – leveling. Clinometer Compass and Brunton Compass:-To find out dip and strike of the beds. GPS:- Fundamentals and applications.
ALLIED – 4

PHYSICS II

UNIT – I: WAVE MECHANICS


UNIT – II : NUCLEAR PHYSICS


UNIT – III : ENERGY PHYSICS


UNIT – IV: CRYSTALLOGRAPHY

Crystallography : The crystal structure – Unit Cell –Bravais lattice- structures of simple cubic-BCC and FCC- co ordination number, packing factor calculation for the above structures –Hexogonal closed packed(HCP) structure -Miller indices – concept of Reciprocal Vectors.

UNIT – V: ELECTRONICS

Electronics: Transistor characteristics in common base and common emitter mode- Transistor single stage amplifier- Expression for input impedance, output impedance and current gain.

Digital Electronics : NAND and NOR as universal building blocks- De Morgan’s theorem –statement and proof- Fabrication of diodes and transistors using Monolithic technology–limitations.
Books for Study & Reference

2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
10. Renewable & Sustainable energy sources – Agarwal.
ALLIED PRACTICAL – 2

PHYSICS
(Any 15 Experiments)

1. Young’s modulus – non uniform bending – pin and microscope.
5. Surface Tension and Interfacial Tension – By drop weight method.
7. Sonometer – Determining A.C. Frequency. (Screw Gauge is given).
8. Sonometer – frequency of tuning fork.
10. Air Wedge – Determination of thickness of thin wire.
16. Figure of merit and voltage sensitiveness of table galvanometer.
17. Construction of AND, OR gates using diodes and NOT by transistors.
19. NAND / NOR as universal gate.
20. Demorgan’s theorem verification.
SKILL BASED SUBJECT
PAPER - 2
REMOTE SENSING

Objective:
To understand about the Basic principles of Remote Sensing, Aerial remote sensing, optical remote sensing, Thermal Remote Sensing and application of Remote Sensing.

Unit I

Unit II
Types of remote sensing: based on 1) Energy sources: active and passive. 2) Platforms: aerial and satellite and 3) Sensors: optical, thermal, and microwaves. 4) RADAR. Aerial remote sensing: Types of Aerial Photographs: vertical and oblique. Scale of aerial photographs – flight procedures. Stereoscopes : pocket and mirror stereoscopes.

Unit III

Unit IV

Unit V
A short account of the remote sensing techniques in the study of drainage patterns, major land forms, geological structures. Groundwater exploration and mineral exploration.
REFERENCES AND TEXTBOOKS

NON-MAJOR ELECTIVE
PAPER - 2
ENVIRONMENTAL GEOLOGY

Objective:
To know about the basic concepts of environmental Geology, Causes, effects, strategies for their mitigation, Natural Hazards and Coastal processes.

Unit I

Unit II

Unit III
Volcanoes and Earthquakes: Earthquakes: Magnitude and intensity. Plate boundary related Earthquakes - Earthquake processes (Faulting, Tectonic group). Earthquake shaking (seismic waves, seismograph) -Earthquake cycle - Earthquake caused by Human Activity- Effects of Earthquakes – Tsunami - Earthquake risk and Earthquake prediction - Earthquake warning system. Volcanic activity - Volcanic Hazards, Forecasting volcanic activity. Landslides: Human use Landslide - Minimising the Landslide Hazards- Perception of Landslides,

Unit IV
Unit V

REFERENCES AND TEXTBOOKS

OBJECTIVE:
To familiarize about the nature, forms, habit, symmetry elements, measurements of interfacial angles and Twin crystals. The classification of crystal into system and classes.

UNIT I

UNIT II
Classification of crystals into systems and classes – Holohedral, Hemihedral, Hemimorphic and Enantiomorphic forms in crystals. Elementary knowledge of spherical and stereographic projections. Study of the symmetry elements, and forms of the Normal, pyritohedral, tetrahedral and plagiohedral classes of cubic system with special reference to well developed crystals of Galena, Spinel, Garnet, Flourite, Diamond, Pyrite, Tetrahedrite, Boracite and cuprite.

UNIT III
Study of symmetry elements and forms of Normal, Hemimorphic, Tripyramidal, Pyramidal Hemimorphic, Sphenoidal and Trapezohedral classes of Tetragonal system with special reference to well developed crystals of Zircon, Rutile, Cassiterite, Vesuvianite, Apophyllite, Shellite, Melonite, Wulfenite and Chalcopyrite.

UNIT IV
Study of the symmetry elements and forms of Normal, Hemimorphic Tripyramidal, pyramidal Hemimorphic, Trapezohedral, Rhombohedral, Rhombohedral Hemimorphic, Trihhoombohedral and Trapezohedral classes of Hexagonal system with special reference to well developed crystals of Beryl, Zincite, Apatite, Calcite, Corundum, Tourmaline, Phenacite and Quartz. Study of the symmetry elements and forms of the Normal, Hemimorphic and Sphenoidal classes of Orthorhombic system with special reference to well developed crystals of Barite, olivine topaz, staurolite, Sulphur, Calamine, Struvite and Epsomite.
Unit V

TEXT BOOKS

REFERENCE BOOKS
PAPER-6
MINERALOGY

Objective:
To learn about the physical, chemical and optical properties of minerals and their utility in the mineral based industries.

Unit I

Unit II
Mineralogy, structure, chemical composition, optical and physical properties, modes of occurrence and industrial uses of the following group of minerals: Quartz - Feldspar - Feldspathoid - Zeolite.

Unit III
Mineralogy, structure, chemical composition, optical and physical properties, modes of occurrence and industrial uses of the following group of minerals: Pyroxene – Amphibole – Mica - Olivine - Garnet.

Unit IV
Physical and optical properties, chemical composition, uses and modes of occurrence of the following minerals: Epidote, Chlorite, Scapolite, Cordierite, Talc, Serpentine, Steatite, Calcite, Dolomite, Andalusite, Kyanite, Sillimanite, Topaz, Staurolite, Beryl, Tourmaline, Wollastonite, Fluorite, Apatite, Zircon, Rutile, Sphene and Corundum.

Unit V
Mineralogy, mode of occurrence, uses and distribution in India of the minerals required for the following industries: Abrasives, Fertilizer, Paint, Refractory, Glass, Ceramic and Cement - Mineral wealth of Tamil Nadu.
REFERENCES AND TEXTBOOKS

PAPER - 7
ECONOMIC GEOLOGY

**Objective:**
To learn about the distribution and mode of occurrence of minerals, minerals used in various industries, and uses of Gemstones.

**Unit I**

**Unit II**

**Unit III**

**Unit IV**
Diagnostic physical properties, chemical composition, uses, modes of occurrence and distribution in India of the following economic minerals. Graphite, Realgar, Orpiment, Stibinite, Molybdenite, Cinnabar, Anglesite, Barite, Gypsum, Celestite, Corundum, Ochre, Ilmenite, Chromite, Franklinite, Cassiterite, Magnesite, Cerussite, Halite, Fluorite, Phosphatic Nodule, Monazite, Wollastonite, Colembite, Tantalite, Samarskite, Asbestos, Steatite and Vermiculite. Mineralogy, mode of occurrence, uses and distribution in India of the following precious metals and minerals. Gold

**Unit V**
Mineralogy, mode of occurrences, uses and distribution in India of the following metalliferous deposits – Iron, Manganese, aluminium, copper, lead, Zinc – chromium. Fossil fuels – coal – uses, classification, constitution, origin and distribution in India. Petroleum- composition, uses, theories of origin, oil traps, and important oil fields of India.

**TEXT BOOKS AND REFERENCE BOOKS**
5. Krishnaswamy ,s. India’s Mineral Resources, Oxford and IBH.
Objective:
To study about the open cast and underground mining operations, sampling techniques, mining equipments and Mitigation of mining hazards.

Unit I

Unit II

Unit III

Unit IV
Unit V

TEXT BOOKS AND REFERENCE BOOKS

2. Mckinstry- Mining Geology.
SKILL BASED SUBJECT
PAPER - 3
GEMMOLOGY

Objective:
To understand about the Physical, Chemical and Optical properties of Gemstones, occurrences and distribution of gemstones and Gemstone treatments.

Unit I

Unit II
Nature of crystals: distinction between crystalline and amorphous material, crystal symmetry. Twinning, parallel growth, crystal form, crystal habit, seven crystal system. Identification of rough stones.

Unit III
Physical properties: hardness and its applications in gemmology and limitations. Cleavage, Fracture, parting, and their importance in gemology and lapidary work. Specific gravity-utility and determination by hydrostatic weighing, heavy liquids, floatation and pycnometer. Inclusions and other features of gemstones.

Unit IV

Unit V
REFERENCE AND TEXTBOOKS

SEMESTER VI

PAPER - 8

IGNEOUS PETROLOGY

Objective:
To learn about the formation of rock due to Igneous activity and magma types, Classification of Igneous Rocks, Petrography and Petrogenesis of various igneous rocks.

Unit I
Definition of Petrology – Earth zones. Composition and constitution of magmas – Primary and Parental Magmas. Forms of Intrusive igneous rocks: Concordant forms - Sill, Laccolith, Lopolith and Phacolith, Discordant forms - Dykes, Cone Sheets, Volcanic neck, Ring dyke, Batholiths, Stocks, Bosses and Psymlaths. Forms of Extrusive igneous rocks: Lava flows, Pyroclastic deposits - Agglomerate, Lapilli, volcanic ash and volcanic froth

Unit II

Unit III

Unit IV
Texture, Mineralogy, Classification, and Modes of occurrence of: Granite, Granodiorite, Syenite, Diorite, Gabbro, their hypabyssal and volcanic equivalents. Petrographic characters, distribution in India and origin of Pegmatites, Lamprophyres, Alkaline rocks, Dunite, Peridotite and Anorthosites.
Unit V

REFERENCE AND TEXTBOOKS
PAPER - 9
SEDIMENTARY AND METAMORPHIC PETROLOGY

Objective:
To learn about the occurrence, origin, classification, texture and structure, petrographic and petrogenesis of sedimentary and metamorphic rocks.

Unit I

Unit II

Unit III

Unit IV

Unit V
REFERENCE AND TEXTBOOKS
2. Huang, W.T.- Petrology, MC Graw Hill
4. Harker, A.- Petrology for Students, Cambridge,
Objective:

To learn about the origin of groundwater and its distribution, geological favouring condition of aquifers and its types, Groundwater occurrence in igneous, sedimentary and metamorphic rocks, evaluation of various aquifer parameters through pump tests and effects of Groundwater quality in various rock types.

Unit I
Definition of hydrogeology and groundwater – Types of groundwater based on origin - Hydrological cycle - Vertical distribution of ground water – Springs: types, geological conditions favouring development of springs - Definition of aquifers, aquitards and aquicludes - Types of Aquifers: unconfined, semi-confined, confined and perched – Artesian wells.

Unit II

Unit III
Groundwater exploration by electrical resistivity method – Outline of dug wells, tube wells, jetted wells, infiltration galleries and collector wells – Well design and development – Fluctuations of groundwater – Groundwater recharge methods.

Unit IV
Sea water intrusion: causes, consequences and, preventive and control measures – Groundwater resources of Tamil Nadu including its quality, Ground water quality in various rock types – Parameters considered for assessing groundwater quality suitability for drinking and irrigation purposes – The latest drinking and irrigation water standards of WHO and BIS – Waterborne diseases.

Unit V
REFERENCE AND TEXTBOOKS
CORE PRACTICAL - 3
CRYSTALLOGRAPHY AND MINERALOGY

CRYSTALLOGRAPHY

CRYSTAL MODELS

SIMPLE TWIN MODELS
Galena, Fluorite, Pyrite, Rutile, Calcite, Quartz, Staurolite, Gypsum, Augite, Orthoclase, Albite.

MINERALOGY

Megascopic Mineralogy:

Microscopic Mineralogy:
Description of optical properties and their identification of the following minerals: Quartz, Orthoclase, Microcline, Albite, Labradorite, Nepheline, Leucite, Enstatite, Hypersthene, Augite, Diopside, Hornblende, Glaucophane, Biotite, Muscovite, Olivine, Epidote, Garnet, Apatite, Zircon, Sphene, Tourmaline, Calcite, Andalusite, Kyanite, Sillimanite, Staurolite, Cordierite, Apatite, Beryl, Topaz, Calcite, Dolomite, Tourmaline, Zircon, Fluorite.

Blow Pipe:
Identification of the following mineral powders by simple blow pipe tests: Apatite, Barite, Calcite, Celestite, Cerusite, chalcopyrite, Galena, Gypsum, Chromite, Haematite, Magnesite, Magnetite, Psilomelane, Pyrolusite, Siderite, Sphalerite, Strontianite, Witherite, Stibnite, Ilmenite and Wolframite.
CORE PRACTICAL - 4
PETROLOGY AND ECONOMIC GEOLOGY


ECONOMIC GEOLOGY

Megascopic identification and description, Indian occurrences and uses of the following ore and industrial Minerals: Realgar, Orpiment, Stibnite, Molybdenite, Galena, Sphalerite, Cinnabar, Covelite, Bornite, Chalcopyrite, Pyrite, Arsenopyrite, Marcasite, Barite, Celestite, Gypsum, Cuprite, Zincite, Corundum, Hematite, Ilmenite, Magnetite, Chromite, Franklinite, Cassiterite, Rutile, Pyrolusite, Psilomelane, Goethite, Limonite, Bauxite, Calcite, Dolomite, Magnesite, Siderite, Aragonite, Witherite, Strontionite, Cerussite, Azurite, Malachite, Chrysocolla, Columbite, Halite, Fluorite, phosphatic nodule, Monazite, graphite, Coal and its varieties.
ELECTIVE
PAPER - 2
GEOGRAPHIC INFORMATION SYSTEM

Objective:
To learn about the basic aspect of Geographic information system, types of vector and raster data and GIS application in Geology.

UNIT-I

UNIT-II
Spatial data-introduction-maps and their influence on the character of spatial data. Thematic characteristics. Other sources of spatial data, Spatial data models, structures and computer applications.

UNIT-III
Attribute data management-introduction-database data models-creating a data base-GIS data base applications.

UNIT-IV
Spatial data-Raster data-Vector data-Development in data base-data input and editing.

UNIT-V
Exposure to GIS software - GIS packages - GIS applications in Agriculture, soils and Geology.

REFERENCE AND TEXTBOOKS
ELECTIVE
PAPER - 4
MARINE GEOLOGY

Objective:
To understand about the Physical and chemical properties of Ocean water, behavior of tides and waves, marine resources, physical, chemical and biological oceanography.

Unit I
Introduction and historical development, physical features and origin of Ocean Basin. Submarine topographic forms – continental margin, ocean basin floor, mid – ocean ridge system, submarine canyons, oceanic trenches, seamounts and guyots. A brief outline of formation, development and classification of coast.

Unit II

Unit III
Physical Oceanography: T-S diagrams; mixing processes in the oceans; characteristics of important water masses. Wind generated waves in the oceans; their characteristics; shallow and deep water waves. Propagation, refraction, and reflection of waves. Wave spectrum, principles of wave forecasting. Tide-producing forces and their magnitudes; prediction of tides by the harmonic method; tides and tidal currents in shallow seas, estuaries and rivers.

Unit IV
Chemical Oceanography: Composition of seawater – Classification of elements based on their distribution; major and minor elements, their behavior and chemical exchanges across interfaces and residence times in seawater. Chemical and biological interactions – Ionic interactions; biochemical cycling of nutrients, trace metals and organic matter. Air-sea exchange of important biogenic dissolved gases; carbon dioxide, carbonate system; alkalinity and control of pH; biological pump.

Unit V
Biological Oceanography: Classification of the marine environment and marine organisms. Physio-chemical factors affecting marine life – light, temperature, salinity, pressure, nutrients, dissolved gases; adaptation and biological processes. Primary and
secondary production; factors controlling phytoplankton and zooplankton abundance and diversity; plankton and fisheries oceanography; benthic organisms; coastal marine communities and community ecology – estuaries, coral reefs and mangrove communities, deep-sea ecology including hydrothermal vent communities.

**REFERENCE AND TEXTBOOKS**

7. K.Siddhartha (2013)"Oceanography A Brief Introduction
Objective:
To understand about the various techniques used for mineral exploration, basic principles, instruments, data generation in the field and exploration.

Unit I

Unit II

Unit III

Unit IV
Unit V

REFERENCE AND TEXTBOOKS

Geological Field work

It is an integral part of the course, students should be taken to a field training during the academic year.

First Year
Students should be taken in the local area for studying geomorphological, structural aspect of geology. The duration of the trip may be a week and submit a report to the department.

Second Year
Students should be taken to nearby area and familiarize Paleontological and Stratigraphical aspect, collect samples from the field and display at the time of their practical examination for internal evaluation. The duration may be a week.

Third Year
A visit to geologically interested and mineralized zones within Tamilnadu it include mine visit, geological mapping, minerals, rocks collection and display at the time of their practical examination for internal evaluation. The duration may be a week.