PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

- Master programme in Applied Geology aims to provide comprehensive knowledge based on various branches of Geology, with special focus on Applied Geology subjects in the areas of Geomorphology, Structural geology, Hydrogeology, Petroleum Geology, Mining Geology, Remote Sensing and Environmental geology.
- To provide an in-depth knowledge and hands-on training to learners in the area of Applied Geology and enable them to work independently at a higher level education / career.
- To gain knowledge on the significance of Dynamics of Earth, basic principles of Sedimentology and Stratigraphy and economic mineral formations and related exploration operations in industries.
- To impart fundamental concepts of economic mineral explorations, geological mapping techniques, geomorphologic principles, and applications of geology in engineering and

PROGRAMME OUTCOMES (POs):

- Thorough knowledge on the subject of geology and its branches and research experience through meticulously delivered courses and a supervised master project.
- Competence in geological mapping and field surveying, identification of rocks and minerals, interpreting geophysical and geological data for identification of ores and petroleum and awareness about natural hazards and mitigation.
- Familiar with hydro geological concepts, engineering concepts in civil, geotechnical and petroleum industries and geology of India and other continents.
- Built in concern for protection of rocks and ore minerals, metals, soil and water pollution abatement and solid waste disposal methods.
- Professionally skilled for higher studies in research institutions and to work in chemical industries.
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**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

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AG7101  APPLIED MATHEMATICS FOR GEOLOGISTS  L T P C
3 0 0 3

OBJECTIVES

- To train the students to address the mathematical problems involved in geological science and understand various sampling, quantitative and statistical problems pertaining to geology.

UNIT I  SYSTEM OF LINEAR EQUATIONS AND INTERPOLATION  9

UNIT II  NUMERICAL INTEGRATION AND ORDINARY DIFFERENTIAL EQUATIONS  9

UNIT III  EMPIRICAL STATISTICS  9
Types of Sampling - Description of discrete and continuous data – Measures of Central tendency and dispersion for grouped and ungrouped data – Measures of position – Box and Whisker plot.

UNIT IV  ESTIMATION THEORY  9

UNIT V  TESTING OF HYPOTHESES  9
Sampling distributions - Type I and Type II errors - Tests based on Normal, t, χ² and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

TOTAL: 45 PERIODS

OUTCOME

- Students will develop the knowledge on mathematics and statistics and its use in resource evaluation and assessment.

REFERENCES


AG7102  GEOMORPHOLOGY  L T P C
3 0 0 3

OBJECTIVE

- To study the sedimentation process, its physical and chemical characteristics to understand the sedimentary basin history to review its potentiality of the basin for economic resources exploration and to understand the geological framework with time and space.

UNIT I  INTRODUCTION TO GEOMORPHOLOGY  9
Basic concepts, endogenous and exogenous processes, tropics, marine, fluvial types and tools, processes of weathering and soil formation. Mass movement, planation surfaces and geomorphic cycle.
UNIT II  FLUVIAL PROCESSES AND LAND FORMS  9
Drainage basin and network characteristics, genetic classification of streams, river valleys, work of river, sediment load, yield, channel geometry. Bedrock channels, classification of rivers and river metamorphosis. Karst landforms.

UNIT III  AEOLIAN PROCESSES AND LANDFORMS  9

UNIT IV  COASTAL PROCESSES AND FORMS  9
Coastal landforms, coral reefs, time based coastal changes, coasts of the world. Seal level changes, causes and neotectonism.

UNIT V  NATURAL HAZARDS AND ENVIRONMENTAL MANAGEMENT  9
Methods, models of sediment deposition due to natural hazards, studies in three and four dimensions, natural hazards and methods of environmental management

TOTAL: 45 PERIODS

OUTCOME
• Student will be prepared to address the sedimentary basins to look for economic resources evaluation and exploitation programme.

REFERENCES

AG7103  MINERALOGY

OBJECTIVE:
• To study the crystallization process, formation of minerals and their physical and chemical characteristics to understand the nature of geological framework with time and space and to review the potentiality of economic resources for exploration.

UNIT I  CRYSTALLOGRAPHY  9
Classification of crystals, systems and classes of symmetry; International system of crystallographic notation; Use of projection diagrams to represent crystal symmetry. Unit Cells, Motifs and Lattices. Point groups and space groups.

UNIT II  ELEMENTS AND MINERALS  9
Stoichiometry, atomic substitution, solid solution series and exsolution. Chemical bonding and mineral properties. Rules governing atomic close-packing in crystalline solids and co-ordination number. Positioning of trace elements in minerals

UNIT III  DESCRIPTIVE MINERALOGY  9
UNIT IV  
**OPTICAL MINERALOGY**  9

UNIT V  
**X-RAY CRYSTALLOGRAPHY**  9
Principle of X-ray powder diffraction, Measurement of X-ray powder diffraction patterns, Powder diffractometers, Goniometer design in powder diffractometry, Monochromatic radiation, Bragg-Brentano geometry, Debye-Scherrer geometry.

TOTAL: 45 PERIODS

OUTCOME
- Student will be prepared to address the geological resources for economic resources evaluation and exploitation programme.

REFERENCES

AG7104  
**STRATIGRAPHY AND APPLIED PALAEONTOLOGY**  
L T P C  
3 0 0 3

OBJECTIVES
- To train the students to address the exposed and subsurface rock layers, its description with respect to tectonics, rock type, structures and geological frame work. Interpretation of stratigraphic architecture. The Paleontology knowledge equips the students to understand paleoenvironment of sedimentary system.

UNIT I  
**PHYSICAL STRATIGRAPHY**  9

UNIT II  
**EXPLORATION STRATIGRAPHY**  9
Applications of stratigraphy in mineral, metal, non-metal, coal and hydrocarbon explorations, study of principles of seismic stratigraphy, sequence stratigraphy, Chemostratigraphy, Magnetostratigraphy and applications.

UNIT III  
**INDIAN STRATIGRAPHY**  9
Litho-Chrono stratigraphic classification of Archaean to Recent, Sedimentary basins of India. Origin and distribution of mineral and fossil fuel deposits of India through geological time.

UNIT IV  
**APPLIED PALEONTOLOGY**  9
UNIT V  MICROPALÆONTOLOGY.  9
Evolution, morphology and taxonomy of benthic and planktic of multi microfossil groups-Foraminifera, Ostracoda, Nannofossil, Algae and palynomorphs. Interpretation of paleobathymetry and sedimentary depositional studies. Exercises on stratigraphy boundary demarcation based on long range and short range forms. Trilinear diagram-plotting of fossil abundance and determination of environment of deposition. Preparation of biofacies map –panel diagram. Preparation of spatial and temporal charts.

TOTAL: 45 PERIODS

OUTCOME
• Students will develop the knowledge on sedimentary basin history and environment to review it’s potentially for resource evaluation

REFERENCES
2. Krishnan, M.S., Geology of India and Burma III Ed.IBH Publishers, New Delhi, 1984
4. Shorock and Twenhofel Principles of Invertebrate Palaeontology, IBH New Delhi, 1983
5. Ravindra Kumar, Fundamentals of historical Geology and stratigraphy of India, Wiley Eastern Ltd. New Delhi, 1985

AG7105  STRUCTURAL GEOLOGY AND GEOTECTONICS  L T P C  3 0 0 3

OBJECTIVE
• This course is an introduction to the fundamentals of structures and the underlying physical processes of rock deformation and geotectonics. It describes about the geological structures and identification of structural features, how to recognize them in the field, their significance in geological setup, and exploration of geological resources.

UNIT I  INTRODUCTION  9
Concept, approach and scope of structural geology, primary and secondary structures. Principles of geological mapping and map reading, projection diagrams.

UNIT II  DEFORMATION MECHANISMS & MICROSTRUCTURES  9

UNIT III  FAULTS  9
Fault rocks, recognition, classification of faults and fault surfaces, slip sense and surface effects. Dynamic analysis of faults, thrust fault terminology, role of fluid pressure. Normal faults, strike-slip faults.

UNIT IV  FOLDS  9
Folds: Elements of fold geometry, fold classification. Folding mechanisms, Regional fold styles. Study of superposed folds.
UNIT V  GEOTECTONICS

OUTCOME
• After completing this course, students can identify important structures and will have better understanding on various structural signatures, and tectonic setups.

REFERENCES

AG7111  MINERALOGY AND STRUCTURAL GEOLOGY LAB AND GEOLOGICAL MAPPING TECHNIQUES  L T P C  0 0 4 2

UNIT I  CRYSTALLOGRAPHY AND PROPERTIES OF MINERALS  12

UNIT II  MINERAL CALCULATION AND 4- AXES UNIVERSAL STAGE  12
Calculation of structural formula for important rock forming mineral groups. Determination of anorthite content and twin law in plagioclase feldspars.

UNIT III  STRIKE, DIP AND THICKNESS PROBLEMS  12
Studies of contours and different land forms – Strike, true dip and apparent dip problems - Measurement of thickness and width of the outcrops

UNIT IV  STRUCTURAL MAPS AND STEREOGRAPHIC PROJECTIONS  12
Completion of outcrops in geological maps - Three point problems - Drawing of profiles and studies of geological maps - Determination of true and apparent dip, plunge and pitch of linear structures.
UNIT V GEOLOGICAL MAPPING TECHNIQUES


REFERENCES

AG7112 PLANE AND GEODETIC SURVEYING LABORATORY

OBJECTIVE
- To familiarize with the various surveying instruments and methods.

EXERCISES:
1. Chain traversing 8
2. Compass traversing 8
3. Plane table surveying – Method of intersection 4
4. Plane table surveying – Three point problem (any one method) 4
5. Plane table surveying – Two point problem 4
6. Plane table traversing 4
7. Fly levelling using dumpy/tilting level 4
8. Check levelling using dumpy/tilting level 4
9. Measurement of horizontal and vertical angles using theodolite. 8
10. Determination of tacheometric constants using horizontal and inclined line of sight 4
11. To determine the elevation of an object using single plane method when base is accessible and inaccessible 4
12. GPS and Total Station – demonstration only. 4

OUTCOMES
- At the end of the course the student will be able to use various surveying instruments like chain, compass, plane table, level and theodolite for mapping.

REFERENCES
AG7201 EXPLORE GEOPHYSICS AND FIELD TECHNIQUES  L T P C  3 0 2 4

OBJECTIVE

- To study the physical properties of earth and application of physics in geology, to understand subsurface features and structures for better understanding of subsurface geology. It describes various geophysical techniques and their field setup, data processing and interpretation.

UNIT I INTRODUCTION & ELECTRICAL METHODS 9+6

FIELD TECHNIQUES:- Resistivity surveys – Wenner and Schlumberger methods – electrical sounding and profiling – problems on these methods – methods – calculation of auxiliary point

UNIT II GRAVITY METHODS 9+6

FIELD TECHNIQUES:- Filed survey – sounding and profiling – SP methods - Interpretation of data – curve matching use of standard computer packages in interpretation

UNIT III MAGNETIC METHODS 9+6
Magnetic methods – principle - field procedure – magnetometers – interpretation of magnetic data – size and shape of bodies – correction of magnetic data - applications - airborne geophysical surveys

FIELD TECHNIQUES:- Problems on magnetic and gravity methods – preparation of anomaly maps – methods of corrections

UNIT IV SEISMIC METHODS 9+6

FIELD TECHNIQUES:- Problems on refraction and reflection methods – 3 layer and inclined beds – calculation based on intercept time and cross over distance

UNIT V RADIOACTIVITY METHODS AND GEOPHYSICAL WELL LOGGING 9+6

FIELD TECHNIQUES:- Radioactive methods - problems on well logging – interpretation of data.

TOTAL: 75 PERIODS

OUTCOME

- Better understanding on geophysical anomalies, interpretation of subsurface features and modelling of geological structures.
REFERENCES
3. Dobrin, M.B An introduction to geophysical prospecting, McGraw Hill, New Delhi, 1984

AG7202 GEOCHEMISTRY

OBJECTIVE
- To study the chemical properties of earth and application of chemistry in geology, to understand rock chemistry and evolution of various rock types through geochemical differentiation. Also to understand various surface guides for exploration of economical ores and minerals.

UNIT I PRINCIPLES OF GEOCHEMISTRY
Introduction – Periodic table, Geochemistry of the Earth; Formation of the solar system and geochemical history of the earth. The geochemical cycle- Distribution of elements in rocks and soils.

UNIT II GEOCHEMISTRY OF MINERALS, ROCKS AND WATERS
Mineral stability, compositional changes in minerals. River water, Seawater, Seafloor hydrothermal systems; Groundwater and Lakes. Characteristics of Magma, Melting of rocks, Water in Magmas, eutectic and melting. Distribution of trace components between rocks and melts.

UNIT III ISOTOPE GEOCHEMISTRY

UNIT IV EXPLORATION GEOCHEMISTRY

UNIT V ENVIRONMENTAL GEOCHEMISTRY

OUTCOME:
- Better understanding on geochemistry of rocks and minerals and interpretation of geochemical path finders for economical minerals and ores.

REFERENCES
AG7203  
IGNEOUS AND METAMORPHIC PETROLOGY  
L T P C  
3 0 0 3

OBJECTIVE
- This course is an introduction to the igneous processes, physical and chemical characteristics of magma, and various rock types. It describes occurrence and geological setting of igneous rocks, metamorphic agents and formation of metamorphic rocks.

UNIT I  
IGNEOUS PETROLOGY  

UNIT II  
PHASE DIAGRAMS & IGNEOUS ROCKS OF DIFFERENT TECTONIC SETTINGS  

UNIT III  
DESCRIPTIVE PETROLOGY  
Geochemistry, Petrography and Field relations of Calc-Alkaline Volcanic Suits, Calc-Alkaline Plutonic suits, Sub alkaline Basaltic and ultramafic suits, and Alkaline Suits. Distribution and tectono magmatic setting of important igneous complexes of India.

UNIT IV  
METAMORPHIC PETROLOGY  

UNIT V  
METAMORPHIC FACIES & METASOMATISM  
Facies classification and systematic description of regional and thermal metamorphism, pelitic, basic-ultabasic and impure calcareous rocks. Metasomatism, ultametasomatism and anatexis. Metamorphism and plate tectonics. Paired metamorphic belts – EPMA Studies – PT Estimates – ITD

TOTAL: 45 PERIODS

OUTCOME
- Student will be able to understand the Igneous and metamorphic processes and evolution of earth resources and rock types.

REFERENCES
OBJECTIVE

- To study the sedimentation process, its physical and chemical characteristics to understand the sedimentary basin history to review its potentiality of the basin for economic resources exploration and to understand the geological framework with time and space.

UNIT I ORIGIN AND CLASSIFICATION OF SEDIMENTS

Weathering and erosion process, products, principles of sedimentation process, scope, applications, classification of sedimentary rocks, Basin forming processes, sediment transport mechanisms.

UNIT II SEDIMENTOLOGY

Sedimentary textures, structures-primary, secondary and biological structures. Provenance studies, diagenesis of sediments, framework matrix and cement of terrigenous sediments. Definition, measurement and interpretation of grain size, roundness and sphericity, paleocurrent analysis.

UNIT III SEDIMENTARY FACIES

Facies modelling for marine, non-marine and mixed sediments, tectonics and sedimentation, cyclic sediments. Structure contours and isopach map.

UNIT IV SEDIMENTARY BASINS

Description of sedimentary basins of India, classification, interpretation to the depositional environment.

UNIT V SEDIMENTARY PETROLOGY

Description of Siliciclastic, argillaceous and carbonate sedimentary rocks: classification, texture, structure, origin, diagenesis and depositional environment of sandstones, conglomerate, breccias, shale, limestone and dolomite. Carbonaceous sedimentary rocks: evaporates, cherts, phosphorites and iron bearing sedimentary rocks.

TOTAL: 45 PERIODS

OUTCOME

- Student will be prepared to address the sedimentary basins to look for economic resources evaluation and exploitation programme.

REFERENCES

OBJECTIVE

- To develop analytical skill and practical exposure on geochemistry to the students to understand the chemical properties of water, sediments and minerals. Also training on sophisticated analytical instrument handling in geochemistry and their application in geology.

UNIT I  ANALYSIS OF ORES  20
Dolomite, Galena, Haematite by titrimetric / gravimetric methods

UNIT II  ANALYSIS OF WATER  28
Acidity, alkalinity, hardness by titrimetry, total dissolved solids by gravimetry, iron by spectrophotometry, sodium and potassium by flame photometry

UNIT III  DEMONSTRATION EXPERIMENTS  12
PH, conductometry, IR, UV-visible spectrophotometry, AAS

OUTCOME

- Better understanding on geochemistry of rocks, soil, water and other earth materials.

REFERENCES


UNIT I  IGNEOUS PETROGRAPHY  9
Study of textures and structures of igneous rocks. - Systematic megascopic and microscopic study of the following igneous rocks: granite, granodiorite, syenite, diorite, gabbro, dolerite, basalt and rhyolite.

UNIT II  SEDIMENTARY PETROGRAPHY  9
Megascopic and microscopic identification of common sedimentary rocks, structures, textures

UNIT III  METAMORPHIC PETROGRAPHY  9
Study of textures and structures of important metamorphic rocks - Systematic megascopic and microscopic study of important and common metamorphic rocks: Microscopic study of hornblende schist, mica-granite-schist, marble, quartzite, amphibolite, Charnockites etc.

UNIT IV  PETROCHEMICAL CALCULATIONS  9

UNIT V  SEDIMENTARY TECHNIQUES  24

TOTAL: 60 PERIODS
AG7213  SEMINAR  L T P C  0 0 2 1

OBJECTIVE

- To work on a specific technical topic in Geology and acquire the skills of written and oral presentation.
- To acquire writing abilities for seminars and conferences.

SYLLABUS:

The students will work for two hours per week guided by a group of staff members. They will be asked to give a presentation on any topic of their choice related to Geology and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report and also on the interaction shown during the seminar.

TOTAL: 30 PERIODS

OUTCOME

- The students will be trained to face an audience and to tackle any problem during group discussion in the Interviews.

AG7301  ECONOMIC GEOLOGY  L T P C  3 0 0 3

UNIT I  PRINCIPLES OF ECONOMIC GEOLOGY  9
Introduction – The importance and history of mining - The nature and morphology of the principal types of ore deposit - Textures and structures of ore and gangue minerals - Fluid inclusion studies - Wall rock alteration - Geothermometry, Geobarometry, Paragenitic Sequence, Zoning and dating of ore deposits - Classification of mineral deposits.

UNIT II  INTERNAL PROCESSES  9

UNIT III  SURFACE PROCESSES  9

UNIT IV  GLOBAL TECTONICS AND METALLOGENY  9
UNIT V  INDIAN MINERAL DEPOSITS AND MINERAL ECONOMICS  9

TOTAL: 45 PERIODS

REFERENCES
6. Anthony Evans, Ore Geology and Industrial Mineral, Jhon Wiley & sons, USA, 1993
7. R.M. Umahay, Mineral Deposits of India, Dattsons, New Delhi, India, 2006

AG7302  ENGINEERING GEOLOGY  L T P C  3 0 0 3

OBJECTIVE
- To provide the knowledge of geological investigation for site selection for engineering projects. Rock type and their engineering properties, suitability of site conditions for dam, Tunnel, coastal structure constructions.

UNIT I  SURFACE AND SUBSURFACE GEOLOGICAL INVESTIGATIONS  9
Field investigations, electrical and seismic geophysical methods in subsurface geological investigations for foundation engineering. Description of discontinuities, bed rock attitudes, thickness, calculation of True thickness and vertical thickness of bed rock. Geological information for slope stabilization.

UNIT II  ENGINEERING PROPERTIES OF ROCKS AND SOILS  9
Rock description and engineering classification of rocks – weathering and its significance in engineering site. Engineering properties of rocks and soils, RMR, RQD methods, determination of engineering properties in field and laboratory.

UNIT III  GEOLOGICAL INVESTIGATIONS FOR DAMS&TUNNELS  9
Dams -geological investigations- suitability of site, geological profile from catchment area to Dam site, lithology, structures, topography, slope, drainage system, water budget studies, Reservoir site investigations, siltation analysis, Geological investigations for soft rock and hard rock tunnels construction.

UNIT IV  GEOLOGICAL INVESTIGATIONS FOR COASTAL DEVELOPMENT  9
Coastal erosion and accretion process and its impact. Geological investigations for harbor construction, Coastal protection structures-Sea walls, bulk heads, groins, jetties.

UNIT V  GEOTECHNICAL STUDIES OF LANDSLIDES AND SUBSIDENCE  9
Landslide - Classification, causative factors, control measures. Land subsidence, factors, causes and remedial measures. Geological considerations for monitoring of landslides. Geotechnical problems related to foundation for bridge and building site investigations.

TOTAL: 45 PERIODS

18

18
OUTCOME

- Preparation of professional Geologist to address the site and construction material evaluation for safe construction of Civil engineering projects.

REFERENCES


AG7303 GEOLOGICAL REMOTE SENSING AND GIS

OBJECTIVES

- This course introduces the principle and concepts of Remote Sensing, Image processing and GIS, their applications to geology and natural hazard studies. The students will also undergo training in aerial photo and satellite image interpretation, satellite image processing, digitization and generation of thematic maps in a GIS, buffering and layer analysis for geologic applications.

UNIT I REMOTE SENSING AND PHOTOGRAMMETRY 12 + 6
Introduction to remote sensing, aerial and space borne platforms. Global and Indian missions; Spectral properties of natural and geologic features, Photogrammetry – principles and concepts., Image interpretation elements.

Hands on exercise: Elements of aerial photos, satellite images and topographic maps; Setting up of stereoscope, determination of stereoscopic acuity and orientation of aerial photographs under a stereoscope; Interpretation of aerial photographs and satellite images and delineation of tonal and textural units

UNIT II DIGITAL IMAGE PROCESSING AND GIS 9 + 8
Format and Structure of multispectral digital image data; Image pre-processing: Image Enhancements; Image classification; relevance to geology
Introduction to GIS. Components of GIS ; Type of data – spatial and non spatial data – data structure – database concepts – data input – retrieval – vector and raster formats –; standard GIS packages – buffering and overlay analysis; Assigning rank and weights for geologic studies.

Hands on exercise : Familiarisation with Image Processing and GIS softwares; Enhancement, Rationing, PCA and fusion of digital images; Unsupervised and Suprvised classification of satellite images; Digitization and generation of thematic maps in a GIS.

UNIT III GEOLOGICAL AND GEOMORPHIC MAPPING 8 + 4
Introduction to Geomorphology, Significance of landforms - Image characters of landforms. Role of aerial photographs and satellite images in Geomorphic mapping. Lithologic and structural mapping using aerial photos and satellite images.

Hands on exercise: Geomorphic, Structural and Lithologic interpretation from Aerial photos and satellite images.

19
UNIT IV GEOLOGICAL APPLICATIONS 8 + 6
Remote sensing and GIS for mineral exploration, ground water exploration and petroleum exploration. Case studies with methodology.

Hands on exercise: Analysis of aerial photos and satellite for mineral exploration, ground water exploration and petroleum exploration.

UNIT V GEO HAZARDS & GEO-ENVIRONMENTAL APPLICATIONS 8 + 6
Remote sensing and GIS for Landslides and Earthquake studies, Coastal erosion and accretion studies and Coastal Zone Management.

Hands on exercise: Analysis of aerial photos and satellite for landslide, earthquake and coastal hazards study.

TOTAL: 75 PERIODS

OUTCOME
• On completion of this course, the student can recognize geological and geomorphic features in images apart from performing satellite image processing for earth resources and geo-hazard studies. Knowledge will be gained on GIS for earth resources and geo-hazards studies.

REFERENCES

AG7304 HYDROGEOLOGY L T P C 3 0 0 3

OBJECTIVE
• This course is an introduction to the hydrological process in the earth system, estimation of aquifer parameters and potential for groundwater development using geophysical approach and assessment of groundwater quality through hydro geochemical techniques.

UNIT I INTRODUCTION 9

UNIT II GROUNDWATER FLOW 9

UNIT III ESTIMATION OF AQUIFER PARAMETERS 9
UNIT IV  GROUNDWATER DEVELOPMENT  

UNIT V  GROUNDWATER QUALITY  

OUTCOME
• Student will gain knowledge on groundwater flow through earth system and skill to interpret potential for exploration of groundwater.

REFERENCES
4 Elango, L and Jayakumar, R (Eds.) Modelling in Hydrogeology, Unesco-IHP Publications, Allied Publ, 2001
6 Todd, D.K Groundwater Hydrology, John Wiley, 1979
7 Hiscock, K, Hydrogeology: Principles and Practice, Wiley-Blackwell, 2005

OBJECTIVES
• To provide the knowledge on exploration of Petroleum deposits in sedimentary basins, the method of basin analysis, application of sedimentology, geophysics and biostratigraphy in oil exploration, insight to the oil field development methods.

UNIT I  PROCESS OF FORMATION OF HYDROCARBONS  

UNIT II  BASIN ANALYSIS  
Interpretation of surface and subsurface stratigraphic units. Characterization of sediments to its petrophysical nature, diagenesis signatures, porosity, fabric constituents, accommodation, rate of sedimentation, thickness, maturity, basin structure, tectonic history of the sedimentary basins.

UNIT III  DEPOSITIONAL SYSTEMS  
Seismic method of hydrocarbon reservoir exploration. Seismic profiles interpretation techniques, seismic reflection patterns and to decipher the depositional and structural features. Depositional systems, classification, significance in petroleum exploration. stratigraphic cycles.

UNIT IV  WELL-LOGGING, SOURCE ROCK GEOCHEMISTRY AND BIOSTRATIGRAPHY TECHNIQUES  
Well logging techniques, interpretation of logs, geochemical parameters, determination of TOM, TOC, VRO, TTI, and TAMR. Biostratigraphy- study of planktic and benthic foraminifera, paleobathymetry analysis.
UNIT V  OIL FIELD DEVELOPMENT

Well site geological operations, drilling methods, drilling fluids, formation testing, well completion, crude oil types, oil reservoir evaluation.

TOTAL: 45 PERIODS

OUTCOME
- Prepare the student for job in oil industries. To train in the concepts of oil exploration methods and to address the techniques in exploration of petroleum deposits.

REFERENCES

AG7311  GEOLOGICAL FIELDWORK AND INDUSTRIAL TRAINING

OBJECTIVE
- To train the students in the field work so as to have a firsthand knowledge of practical problems related to Geology in carrying out field and industrial geological tasks.
- To develop skills in facing and solving the field problems.

SYLLABUS:
The students individually undertake training in reputed Industries during the summer vacation for a specified period of four weeks. At the end of training, a detailed report on the work done should be submitted within ten days from the commencement of the semester. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOME
- They are trained in tackling a practical field/industry orientated problem related to Geology.

TOTAL: 60 PERIODS

AG7312  HYDROGEOLOGY LAB

UNIT I  POROSITY AND HYDRAULIC CONDUCTIVITY

Groundwater prominence – Hydrological cycle-problems using porosity and specific yield-Hydraulic conductivity – vertical and horizontal-groundwater gradient and contour map preparation-flow velocity – properties of various geological formations-permeameter experiments

UNIT II  AQUIFER PARAMETERS

Determination of hydraulic conductivity in lab – problems on groundwater flow to wells - steady and unsteady flow – estimation of transmissivity and storage coefficient of wells-aquifer compressibility.

UNIT III  WATER BUDGETING

Unsteady flow - Theis recovery methods - Use of computer codes to understand groundwater flow in aquifers – slug tests-water budgeting

22
UNIT IV   GROUNDWATER QUALITY
Determination of ion balance error – problems on hydrochemistry – preparation of water quality
diagrams-drinking and irrigation water quality

TOTAL: 60 PERIODS

AG7411  PROJECT WORK  L  T  P  C  0  0 24  12

OBJECTIVE

- To identify a specific problem for the current need of the society and collecting information
  related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce
  examination.

SYLLABUS:

The student individually works on a specific topic approved by faculty member who is
familiar in this area of interest. The student can select any topic which is relevant to his/her
specialization of the programme. The topic may be experimental or analytical or case studies. At
the end of the semester, a detailed report on the work done should be submitted which contains
clear definition of the identified problem, detailed literature review related to the area of work and
methodology for carrying out the work. At the end of the semester, after completing the work to the
satisfaction of the supervisor and review committee, a detailed report should be prepared and
submitted to the head of the department. The students will be evaluated through a viva-voce
examination by a panel of examiners including one external examiner.

TOTAL: 360 PERIODS

OUTCOME

- On completion of the project work students will be in a position to take up any challenging
  practical problem and find better solutions.

AG7001  ADVANCED REMOTE SENSING TECHNIQUES AND GIS
FOR GEOLOGIC APPLICATIONS  L  T  P  C  3  0 0 3

UNIT I  HIGH RESOLUTION SENSORS AND HYPERSPECTRAL IMAGING DEVICES  9
Introduction - need for high resolution data.- Characteristics, specifications and applications .
Spectrographic imagers-hyperspectral sensors- airborne and space borne..

UNIT II  IMAGE PROCESSING AND INFORMATION EXTRACTION  9
Concept of pure and mixed pixels, Hard and soft classification – Per-pixel and Sub-pixel
classification techniques - spectral unmixing- linear and non-linear, Fuzzy logic - Fuzzy land cover
boundaries, Fuzzy pattern classifiers and fuzzy classification techniques. Neural network
- fundamentals- applications in improving classification accuracy. Feature extraction and selection.

UNIT III  GEOGRAPHIC INFORMATION SYSTEM (GIS)  9
Introduction - map - characteristics - projection - Computer Assisted cartography. GIS -
Components of GIS - Integration of GIS with remote sensing. Data Base Structures, Spatial, Non
spatial, Raster - Vector - Arc Node, DIME, DLG, Polygon - Topology - Data base - Hierarchical,
Network & Relational.
UNIT IV DATA ANALYSIS & MODELLING USING GIS

UNIT V APPLICATIONS OF GIS
Application to groundwater / recharge studies - landslides - Mineral investigation - Petroleum exploration using GIS - GIS and ore-body modeling - coastal studies.

TOTAL: 45 PERIODS

REFERENCES

AG7002 APPLIED HYDRO GEOCHEMISTRY

UNIT I GROUNDWATER SAMPLING AND EQUILIBRIUM
Chemical parameters – sampling and influence of well conditions - sampling for environmental isotopes – pore water sampling – Chemical processes in relation to hydrogeology - calculation of parameters – representation of results – thermodynamics – law of mass action - activity coefficients - saturation indices with respect to common minerals

UNIT II CARBONATE REACTIONS
Carbonate system - solution – precipitation – role of pH and alkalinity – carbonic acid and carbonate equilibrium constants – case studies

UNIT III REDOX REACTIONS

UNIT IV ION EXCHANGE PROCESSES

UNIT V SILICATE WEATHERING
Hydrochemical sequences – major – ion evolution – groundwater in crystalline rocks – hydrochemical processes during flow – clay minerals and changes in water chemistry due weathering

TOTAL: 45 PERIODS

REFERENCES
UNIT I  CHARACTERISTICS
Coal as rock – types of coal – mode of occurrence – structure in coal streams – coals through ages – physical and chemical characteristics of coal – macropetrographics – microlithotypes.

UNIT II  GENETICS AND EXPLORATION

UNIT III  PREPARATION AND UTILISATION

UNIT IV  RESOURCES AND ENVIRONMENT

UNIT V  INDIAN COALFIELDS

REFERENCES

TOTAL: 45 PERIODS

AG7004  EARTHQUAKE DISASTER AND MITIGATIONS L T P C 3 0 0 3
UNIT I  FUNDAMENTALS OF SEISMICITY

UNIT II  SEISMIC RISK ANALYSIS

UNIT III  APPLIED SEISMIC HAZARD ASSESSMENT
Assessment of geological seismic hazards – site response and seismic microzonation – mapping of hazards due to liquefaction and earthquake – induced landslides – use of Geographical Information System for hazard mapping and seismic risk assessment.

UNIT IV  CASE STUDIES
**UNIT V SOCIO-ECONOMIC SYSTEM**


**TOTAL: 45 PERIODS**

**REFERENCES**


**AG7005 ENVIRONMENTAL GEOCHEMISTRY**

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**OBJECTIVES**

- To gain knowledge and handling the assessment of environmental issues through the geochemistry of the earth materials.

**UNIT I PRINCIPLES OF ENVIRONMENTAL GEOCHEMISTRY**


**UNIT II THE CONTINENTAL ENVIRONMENT**


**UNIT III MARINE ENVIRONMENT**


**UNIT IV ENVIRONMENTAL MINERALOGY**


**UNIT V GEOCHEMICAL EXPLORATION ENVIRONMENT**


**TOTAL: 45 PERIODS**

**REFERENCES**

OBJECTIVES

- To provide the knowledge on Geology and environment, impacts due to mineral, soil and land degradation. Expose the students to assess various geological environments like terrestrial, aquatic, etc. Provide knowledge and guidelines to assess and plan various environmental issues.

UNIT I GEOLOGIC ENVIRONMENTS 12
Concept and scope of environmental geology – understanding earth processes and landforms; Geological characteristics of various environmental regimes – fluvial, coastal, marine, Aeolian, desert, and glacial. - Landforms as ecosystem units – Geomorphic controls on biodiversity and its conservation.

UNIT II TERRESTRIAL ENVIRONMENT 8
Environmental degradation due to mining and ore beneficiation – impact and management – Indian case studies - soil and mineral resources and their conservation

UNIT III AQUATIC ENVIRONMENT 8
Geological factors influencing the formation of surface, groundwater and marine Waters – geological basis of groundwater, surface and marine water pollution and management with Indian case studies

UNIT IV GEOLOGY IN ENVIRONMENTAL PLANNING AND MANAGEMENT 8
Environmental impact assessment – geological appraisal of waste disposal sites - geology in planning and siting of land fills - problems of deep well disposal, radioactive waste management - land use planning in EIA

UNIT V GEOLOGICAL HAZARDS AND GLOBAL ENVIRONMENTAL CHANGE 9
Causes, types, Mitigation and Management of earthquakes, landslides, tsunami and volcanoes. ; Causes and Indicators of global environmental change

OUTCOME

- Students outcome with potential knowledge to assess various environmental problems through geology.

REFERENCES

2. Dorothy Merriott, Andrew de Wet, Kirsten Menking, Environmental Geology W. H. Freeman & Co. and Sumanas, Inc. USA, 1997
UNIT IV  GROUNDWATER CONTAMINATION  
Water quality standards – transport processes – sources of contamination – oil spills – deep well disposal site locations – sea water intrusion - hydrogeological systems and monitoring

UNIT V  GROUNDWATER PROTECTION  
Groundwater contamination - methods of assessment - application of groundwater modeling - damage prevention - remediation of aquifers – bio remediation of contaminated aquifers

TOTAL: 45 PERIODS

REFERENCES
5. Marcel van der Perk, Soil and Water Contamination: From Molecular to Catchment, Scale, Taylor and Francis, 2006

AG7008 GEOPROSPECTING L T P C
3 0 0 3

UNIT I  GEOLOGICAL PROSPECTING  
Geological prospecting- field survey and mapping techniques - field equipments- methods of mapping- pits and trenches- sampling-geological map preparation.

UNIT II  ELECTRICAL METHODS  

UNIT III  SEISMIC METHODS  

UNIT IV  MAGNETIC AND GRAVITY METHODS  

UNIT V  GEOCHEMICAL PROSPECTING  

TOTAL: 45 PERIODS

REFERENCES
GROUNDWATER CONTAMINATION

OBJECTIVES
- To teach the significance of groundwater contamination and ecosystems. It also describes the importance of geology in understanding the causes for groundwater contamination and its effects on environment.

UNIT I  INTRODUCTION
Groundwater occurrence and flow – types of porosity – transmissivity and storage coefficient - significance in groundwater contamination - sources of contamination – landfills

UNIT II  TYPES OF CONTAMINATION
Types – point and non point sources – natural and anthropogenic - organic and poly aromatic compounds – biological – other sources – gasoline spills on the water table - chlorinated solvent spills which sink

UNIT III  IDENTIFICATION OF CONTAMINATION
Application of electrical conductivity measurement for soil and groundwater contamination - Application of Ground Penetration Radar and other methods

UNIT IV  TRANSPORT PROCESS
Advection, dispersion and diffusion-sorption, biodegradation, transformation, retardation and attenuation of solutes – radionuclide transport

UNIT V  REMEDIATION
Waste site characterization-Geochemical modelling-Modeling concepts - Thermodynamics - groundwater quality - Emerging remediation methods, including surfactant and co-solvent soil flushing.

TOTAL: 45 PERIODS

OUTCOME
- On completion of this course, students will have better a understanding on the processes and causes of groundwater contamination.

REFERENCES

AG7010  INDUSTRIAL GEOLOGY

UNIT I  ECONOMICS IN MINERAL EXPLORATION
Economic Considerations in Mineral Exploration; Systematic approach to Exploration Expenditure; In-situ and Mineable Reserves; Pit Optimization; Bulk Sampling; Pilot Plant Studies; Demand and Price Projections.

UNIT II  MINERAL/MINE ECONOMICS AND FINANCE
Source of Mine Finance; Factors governing profitability; Concepts of Depreciation, Depletion, Present value, Cash Flow and DCF; Costs-Capital, Fixed / variable, Ownership; P & L Account; Balance Sheet.
UNIT III  MINERAL PROJECT EVALUATION  9
Time Value of Money; Project Evaluation Technique-Pay Back, Discounted Pay Back, DCF, IRR; Project Ranking; Sensitivity analysis; Feasibility study-Prospect and Operating Mines; Preparation of Mine Plan under Mineral Concession Rules.

UNIT IV  MINERAL CONSERVATION  9
Growth of the awareness; Means of conservation; Limitations in Scope; Wealth from Mineral waste; Co-products and By-products; Substitute for Minerals.

UNIT V  MINERAL POLICIES AND ENVIRONMENT  9
National Mineral Policy; Prospecting License and Mining Lease; Mines Act, CMR, MMR, Mines Rules, MMRD Act and Rules, EMP, EIA.

TOTAL: 45 PERIODS

REFERENCES
4. Bruce, A.K. 1990 Surface Mining, Colorado, Society for Mining, Metallurgy and Exploration, Inc. Published Mines/Minerals Legislations

AG7011  MARINE GEOLOGY  L T P C
3 0 0 3

OBJECTIVES
- To teach the Ocean geological resources exploration and exploiting methods, instrumentations, Ocean environment, Ocean geology.

UNIT I  PHYSICAL FEATURES OF THE OCEAN  9
Introduction and scope of Marine Geology; oceanic profile, oceanic features; beaches, coastal classification, erosion and accretion; waves, currents and tides, coastal protection structures

UNIT II  OCEAN RESOURCES  9
Classification of marine mineral deposits. Origin and depositional system of marine resources; beach placers, shelf deposits, deep ocean Phosphatic, Polymetallic nodules, sulfate deposits, hydrocarbon deposits Sea water as a resource.

UNIT III  OCEANOGRAPHIC INSTRUMENTATIONS  9
Descriptions of research vessels, cruise, position fixing in the sea; sampling devices – Grab samplers, bottom samplers, dredges, sediment traps, boomerang samplers, water samplers, Winches, temperature measurement instruments, tools for studying ocean floor topography. POD, COD, GOD and BOD tools kit.

UNIT IV  SEA WATER AND MARINE POLLUTION  9
Concept of sea level changes, physical and chemical properties of seawater. Marine pollution-pathways, residence time, pollutants in the marine environment.

UNIT V  OCEANIC CRUST, SEDIMENTS AND LAW OF THE SEA  9

TOTAL: 45 PERIODS
OUTCOME

- Preparation of man power to address the ocean resources and environment.

REFERENCES


AG7012 MEDICAL GEOLOGY L T P C 3 0 0 3

OBJECTIVES

- To teach the significance of contaminants, pollutants and toxicants in altering the natural geochemical systems. It also describes the importance of geology in understanding human health.

UNIT I INTRODUCTION 9

The Foundations of Medical Geology, Geochemical Classification of the Elements, Contributions to Medical Geology from Public Health and Environmental Medicine, Development of Medical Geology.

UNIT II PATHWAYS AND EXPOSURES 9


UNIT III GEOLOGY HUMAN HEALTH 9

Natural Distribution and Abundance of Elements, Anthropogenic Sources, Uptake of Elements from a Chemical Point of View, Uptake of Elements from a Biological Point of View, Biological Functions of the Elements, Geological Impacts on Nutrition, Biological Responses of Elements

UNIT IV GEOPATHOLOGY AND TOXICOLOGY 9

Environmental Epidemiology, Environmental Medicine, Environmental Pathology, Toxicology, Speciation of Trace Elements. Geophagy and the Involuntary Ingestion of Soil, Natural Aerosolic Mineral Dusts and Human Health, The Ecology of Soil-borne Human Pathogens, Animals and Medical Geology

UNIT V TECHNIQUES AND TOOLS 9

Mapping Geological factors for human health using RS and GIS - Investigating Vector-Borne and Zoonotic Diseases, Mineralogy of Bone, Inorganic and Organic Geochemistry Techniques, Histochemical and Microprobe Analysis in Medical Geology.

TOTAL: 45 PERIODS

OUTCOME

- On completion of this course, students will have better a understanding on the processes and causes of human interference in geological environment and its impact on human health.

REFERENCES

AG7013 MICROPALAEONTOLOGY AND PALYNOLOGY  

UNIT I INTRODUCTION  
Introduction to Micropaleontology-scope, use and its applications in oil industries and Paleogeology studies, Methodology – separation of microfossils from matrix; mounting technique; identification and classification procedures.

UNIT II MICROFOSSILS AND ITS APPLICATIONS  
Study of microfossils from Precambrian-Quaternary; applications – age determination, paleofacies; Interpretation of tectonics from micro faunal evidence.

UNIT III FORAMINIFERA  
Foraminifera – Diamorphism, structure and test, classification of foraminifera; distribution through geological ages; ecology of foraminifera. Uses in sequence biostratigraphic studies.

UNIT IV OSTRACODA  
Ostracoda-classification, ornamentation, orientation of carapace, microfossiles utility-environment significance; marine, non-marine environments and mixed environments.

UNIT V PALYNOLOGY  
Introduction–definition, concept, potential and prospects; Palynofossils classification; affinity of spore, pollen, diatoms and dinoflagellate. Maceration technique; general morphology of acritarchs, fungi, stratigraphic importance Palynology in coal and oil exploration.

TOTAL: 45 PERIODS

REFERENCES  

AG7014 MINERAL EVALUATION AND MANAGEMENT  

OBJECTIVES  
- To provide information on exploration of mineral and ore petroleum deposits, methods of ore reserve estimations, mineral economics and feasibility studies, identification of suitable and profitable evaluation techniques, mineral processing and beneficiation and national mineral policies.

UNIT I PRE FEASIBILITY STUDIES  
Application of Geo Statistics Variogram Range, Kriging -Ore body Optimisation- Bulk Sampling, pilot Plant Saturation Prospecting, Categorisation curve-Block Recovery -grade Vis-à-vis In-situ grade

UNIT II MINE MINERAL ECONOMICS  

UNIT III MINERAL PROJECT FEASIBILITY  
UNIT IV  MINERAL PROCESSING/BENEFICIATION  9

UNIT V  MINERAL POLICIES  9

TOTAL: 45 PERIODS

OUTCOME
• Preparing students for professional employment in mineral mining and beneficiation industries. To train in the concepts of mineral exploration methods and address the techniques in exploration of economical deposits.

REFERENCES

AG7015  MINING GEOLOGY  L T P C
3 0 0 3

UNIT I  MINERAL EXPLORATION  9
Triangulation, Establishment of Local Base from National Grid Base-Review of Surface Mapping, Underground Mapping, Different Plans and Sections-Search for ore-Surface and Concealed Guides to ore - Persistence of ore in depth- Preliminary Investigations–Trenching, pitting, Data Interpretation – Drilling from pits.

UNIT II  MINERAL PROSPECTING  9
Macro/Micro Economic Considerations-Sampling – Types, Sampling Quantity, Spacing, Sampling error of Mean, Sample Data Processing, Interpretation. Surface/underground Definition Drilling – Core, Diamond Drilling arrangement, Core logging, Compositing, Preparation of Slice Plan, Maximising Drill Data Vis-a-vis Cost of Drilling-Preparation of Assay Plans/Sections - Cut off Grade, Determination of Mineable Limits

UNIT II  MINERAL RESERVE ESTIMATION  9
Reserves and Resource – Types and Classification -Geological / Techno economic Considerations in Reserve Classification-Reserve Estimation Methods – Surface and Underground Deposits

UNIT IV  OREBODY MODELLING  9
Integrating Surface/ Underground mapping Drilling Sampling to evolve a 3D Model - Fold/Fault Interpretation from Maps and Bore hole Data - GIS Applications in mining and Mineral Projects.

UNIT V  SURFACE AND UNDERGROUND MINING  9

TOTAL: 45 PERIODS
## REFERENCES

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### AG7016 - NATURAL HAZARDS AND MITIGATIONS

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<thead>
<tr>
<th>UNIT</th>
<th>DISASTER PHENOMENON</th>
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<tr>
<td>UNIT I</td>
<td>Disaster threat - characteristics-parameters – mapping aspects for earthquake, landslides, cyclones flood, drought and epidemics.</td>
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<tr>
<td>UNIT II</td>
<td>Geological and hydrological hazards - Reduction of hazard proneness – reducing structural vulnerability – changing the functional characteristics of settlement – building code provisions.</td>
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<tr>
<td>UNIT III</td>
<td>Elements of risk – vulnerability analysis on dam and other infrastructures – risk assessment – plan area – organizational aspects, planning and mapping levels – socio-economic aspects – cost of risk reducing measures.</td>
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<td>UNIT V</td>
<td>Case Studies and Advanced Tools</td>
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<td>Post disaster review – role of remote sensing and GIS – sequence of activities for global, national and state level case studies on various disasters</td>
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**TOTAL:** 45 PERIODS

### REFERENCES

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### AG7017 - NUCLEAR ISOTOPE GEOLOGY

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<th>UNIT</th>
<th>INTRODUCTION AND THE PHYSICS OF THE NUCLEUS</th>
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<tr>
<td>UNIT I</td>
<td>Radioactive Decay - Nucleosynthesis Geochronology, Basics of Radiogenic Isotope Geochemistry, The K-Ca-Ar system - The K-Ar and Rb-Sr systems - The Sm-Nd system - The U-Th-Pb system - The U-Th-Pb system: Zircon dating - U-Th decay series dating - Other decay systems.</td>
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UNIT III  STABLE ISOTOPE GEOCHEMISTRY  9

UNIT IV  STABLE ISOTOPES AND APPLICATIONS IN PALAEOCLIMATE STUDY  9
Paleontology and Archaeology, application to paleoclimatology-deep sea, continental records. The Carbon Cycle. Isotopes, and climate Tree ring studies

UNIT V  CARBON ISOTOPE AND PETROLEUM GEOCHEMISTRY  9
Sulphur isotopes, diffusion experiments in isotope geology with case studies.

TOTAL: 45 PERIODS

REFERENCES

AG7018  OIL EXPLORATION AND PRODUCTION  L T P C
3 0 0 3

OBJECTIVES
- To provide knowledge on exploration and production of petroleum through various geophysical and geological methods and production of Geology.

UNIT I  SEISMIC PROSPECTING  9

UNIT II  RESERVE ESTIMATION AND DRILLING OPERATION  9
Volumetric oil and gas reserve estimation – proved, probable and possible reserves – Deterministic methods, Three point estimates- Expressing uncertain in the input to volumetric estimation - Rotary Drilling rig components – Basic operations – operational practices and procedures – Drill stem and assembly – descriptions, care, maintenance and handling practices - Drill stem Design – installation of blowout prevention

UNIT III  DRILLING MUD  9

UNIT IV  CASING AND CEMENTATION  9
Casing–types, policy, specifications , forces acting–Casing design – preparation of casing to be lowered. Cementation–composition, properties, types, cementation-procedures applications.
UNIT V WELL LOGGING RESERVOIR ENGINEERING AND PRODUCTION


OUTCOME

- Preparation of man power to address in exploration and production division in oil industry

REFERENCES

1. Brian J. Evans A Hand book for seismic data acquisition in exploration. Geophysical Monograph Series Publisher:

AG7019 ORE GEOLOGY AND MINERAL TECHNOLOGY L T P C

UNIT I ORE MICROSCOPY 3 0 0 3

Introduction to ore microscopy – preparation of samples and specimen - mineral identification – examination of optical properties – under reflected light – reflectance measurement of microindentation hardness.

UNIT II ORE FABRICS


UNIT III FLUID INCLUSION


UNIT IV MINERAL TECHNOLOGY

Ore microscopy usage in mineral technology – information from mineralogical studies – mineral dressing processes.

UNIT V MINERAL BENEFICATION


TOTAL: 45 PERIODS

REFERENCES

OBJECTIVES

- To introduce the concepts of planetary science and geology, which will form a basis to understand planetary remote sensing.

UNIT I INTRODUCTION TO PLANETARY SCIENCE

The sun- vital statistics of the sun -Solar system - origin - physics, chemistry, and the surface features of the solid bodies in the solar system; Solar system. -Celestial sphere- the growth of the geocentric system- physical properties of objects in the solar system.

UNIT II PLANETS

Physical properties- optical properties- rotation and magnetic field-surface temperature. Surface features of the terrestrial planets; Inner planets- Geological phenomena- tectonic, volcanic, impact cratering, eolian, fluvial, glacial and possibly lacustrine and marine processes; Outer planets – formation and evolution processes –satellite-characteristic features.

UNIT III EARTH AND MOON

The earth: Planetary evolution- gross properties – solar terrestrial relations- earth in space-interior-geologic process; Moon-origin- basic facts- telescopic studies - internal structure-surface features-environment- surface composition and mineralogy and atmospheric conditions

UNIT IV ASTEROIDS-METEORITES- COMETS

Classification-physical and chemical properties, difference between asteroids-comets- meteors-geochemistry- relationship between earth and meteorite geochemistry; satellites- medium, small and tiny their- geology, interior, surface properties, atmosphere and potential for life.

UNIT V PLANETARY REMOTE SENSING

Study of planetary images, and construction of geological maps from orbital images and Rover (in situ); planetary data formats-Missions to - Moon- Mars-Venus- for geological exploration; Lunar return samples – Apollo-Luna.

TOTAL: 45 PERIODS

OUTCOME

- At the end of the course, the students will have a sound knowledge of planetary science in general and about the inner planets in particular. In addition, the role of remote sensing in improving our understanding of planetary science will also be appreciated by the students.

REFERENCES

3. A.M. Davis 2003. Meteorites, Comets, And Planets, Published by University of Chicago, IL, USA.
UNIT I  INTRODUCTION
Introduction to Quaternary period and types of Quaternary deposits. End of the Tertiary period and
prologue to the Quaternary period, tectonic movements, magnetic polarity reversals, global sea
level, and littoral sedimentation, Quarternary soil types, shallow water reserves and sediments
used in human activities.

UNIT II  QUATERNARY STUDY TECHNIQUES
Relative chronologies and correlation, use of flora and fauna, non radioactive techniques,
radioactive techniques. dating methods- radiocarbon, U/Th, Pb-Pb with case studies and
dendrochronology

UNIT III  QUATERNARY PERIOD AND EMERGENCE OF HOMINIDS
Causes of Quaternary climate change, manifestation of Quaternary climate change and current
issues in climate change, Human and Quaternary climate change, fauna at the Pliocene-
Quaternary transition, emergence of hominids and evolution of Man.

UNIT IV  QUATERNARY CLIMATE CHANGE
The climate between 2.5 yr and 130,000 yr, ice ages, glaciations, last glaciations and the last
glacial maximum, the deglaciation and the Holocene, Ocean and deep sea environments,
terrestrial environments, lake and desert environments, soils. Humid tropical environments,
subtropical arid zones and warm deserts, fluctuation in the polar region and Mediterranean
environments.

UNIT V  NEOTECTONICS AND DEFORMATION DURING
THE QUATERNARY PERIOD
Recent crustal movements and young magmatism, post glacial crustal uplift, analysis of
Quaternary sediments from borehole data, climate modeling and prediction of climate change.

REFERENCES
1. Bradley, R.S. Quaternary paleoclimatology, methods of paleoclimate reconstruction, Allen and

UNIT I  INTRODUCTION
Introduction to sequence stratigraphy, scope, applications in exploration of hydrocarbons,
stratigraphic terminology, problems and research trends, stratigraphic architecture, facies and sea
level cycles.

UNIT II  METHODS FOR STUDYING SEQUENCE STRATIGRAPHY
Construction of sequence framework, importance of unconformities, assessing regional and global
changes in sea level, areas and volumes of stratigraphic units, hypsometric curves, backstripping,
integrated tectonic stratigraphic analysis.

UNIT III  SEQUENCE DEPOSITIONAL MODEL
Depositional systems and systems tracts, sequence boundaries, litho-log analysis, sedimentary
facies, fossil assemblages, counts and their controls, paleoecology & Milankovitch processes.

UNIT IV  STRATIGRAPHIC CYCLES
Types of stratigraphic cycles, tectno-stratigraphic model, Eustasy, epiorogeny, global cycle chart,
tectonic mechanisms.
UNIT V  SEQUENCE BIOSTRATIGRAPHY, CHRONOSTRATIGRAPHY AND CORRELATION

Determination of the biostratigraphic framework, diachroneity of the biostratigraphic record, dating and correlation of stratigraphic events, time in sequence stratigraphy. Applications of sequence biostratigraphy.

REFERENCES

TOTAL: 45 PERIODS

AG7023  SOIL SCIENCE

OBJECTIVES
• To provide knowledge on exploration and production of petroleum through various geophysical and geological methods and production of Geology.

UNIT I  INTRODUCTION TO SOIL SCIENCE
Nature and importance of soil, soil formation, soil survey, physical chemical and biological characters of soil. Relationship between Soil plants and animal.

UNIT II  SOIL TYPES
Soil types and classification, soil genesis, Soil mineralogy and geochemistry of soil types: laterites, bauxites, ardisols, vertisols, camborthids. Application of soil micro morphology and landscape evolution. Radiometric age determination of soils

UNIT III  SOIL AND CROP PRODUCTION
Elements essential for plants and animals, soil nutrients, nitrogen, phosphorus, potassium, calcium, magnesium and sulphur in soil and their and its significance in plant growth, micronutrients.

UNIT IV  SOIL QUALITY AND LANDSCAPE
Soil and water relation, organic matter in soil, functions of organic matter, organic matter and soil structure, organic matter and essential elements, tillage, cropping systems and fertility and case studies.

UNIT V  SOIL MANAGEMENT AND CONSERVATION
Introduction, irrigation, drainage soil management for field crops, gardens, lawns, pastures, rangelands and forests. Conservation factors and implementation methods.

TOTAL: 45 PERIODS

REFERENCES
2. Donald L. Sparks, Environmental Soil Chemistry, 2002.