THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

DEGREE COURSE

B.Sc. GEOLOGY

UNDER CBCS

(with effect from 2008-2009)

The Course of Study and the Scheme of Examinations

Year/ Semester	Part	Subject	Paper	Title of the Paper	Ins hrs/ Week	Credit	Exam hrs	Max. Marks		
								IA	Uni. Exam.	Total
I Year I Semester	I	Language	Paper I		6	3	3	25	75	100
	II	English	Paper I		6	3	3	25	75	100
	III	Core	Paper I	Physical and Dynamic Geology	6	5	3	25	75	100
		Core Practical	-	-	3	-	-	-	-	-
	III	Allied	Paper I	Chemistry I	4	4	3	25	75	100
	III	Allied Practical	-		3	-	-	-	-	-
	IV			**Environmental Studies**	2	2	3	25	75	100
I Year II Semester	I	Language	Paper II		6	3	3	25	75	100
	II	English	Paper II		6	3	3	25	75	100
	III	Core	Paper II	Paleontology	6	5	3	25	75	100
	III	Core Practical	Practical I	-	3	2	3	40	60	100
	III	Allied	Paper II	Chemistry II	4	4	3	25	75	100
	III	Allied Practical	Practical I		3	2	3	20	30	50
	IV			**Value Education**	2	2	2		50	50
II Year III Semester	I	Language	Paper III		6	3	3	25	75	100
	II	English	Paper III		6	3	3	25	75	100
	III	Core	Paper III	Structural Geology	4	5	3	25	75	100
	III	Core Practical			2	-	-	-	-	-
	III	Allied	Paper III	Physics I	4	4	3	25	75	100
	III	Allied Practical	-		3	-	-	-	-	-
	IV	Skill Based Subject I	Paper I	Geological Mapping Techniques	3	3	3	25	75	100
		Non-Major Elective I	Paper I	Fundamentals of Geoinformatics	2	2	3	25	75	100

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins hrs/ Week	Credit	Exam hrs	Max. Marks		
								IA	Uni. Exam.	Total
II Year IV Semester	I	Language	Paper IV		6	3	3	25	75	100
	II	English	Paper IV		6	3	3	25	75	100
	III	Core	Paper IV	Global Tectonics	4	5	3	25	75	100
	III	Core Practical	Practical II	-	2	2	3	40	60	100
	III	Allied	Paper IV	Physics II	4	4	3	25	75	100
	III	Allied Practical	Practical II		3	2	3	20	30	50
	IV	Skill Based Subject II	Paper II	Photo Geology and Fundamentals of Remote Sensing	3	3	3	25	75	100
		Non-Major Elective II	Paper II	Environmental and Medical Geoscience	2	2	3	25	75	100
III Year V Semester	III	Core	Paper V	Stratigraphy	6	5	3	25	75	100
	III	Core	Paper VI	Crystallography	6	5	3	25	75	100
	III	Core	Paper VII	Mineralogy	6	5	3	25	75	100
	III	Core Practical	-	-	2	-	-	-	-	-
	III	Core Practical	-	-	2	-	-	-	-	-
		Elective I	Paper I	Petroleum Geology	5	5	3	25	75	100
	IV	Skill Based Subject III	Paper III	Techniques in Identification of Rocks and Minerals	3	3	3	25	75	100
III Year VI Semester	III	Core	Paper VIII	Igneous Petrology	5	5	3	25	75	100
	III	Core	Paper IX	Sedimentary and Metamorphic Petrology	4	5	3	25	75	100
	III	Core	Paper X	Economic Geology	4	5	3	25	75	100
	III	Core Practical	Practical III	-	2	3	3	40	60	100
	III	Core Practical	Practical IV	-	2	3	3	40	60	100
		Elective II	Paper II	Geographic information System (GIS)	5	5	3	25	75	100
		Elective III	Paper III	Gemology	5	5	3	25	75	100
	IV	Skill Based Subject IV	Paper IV	Water quality analysis and Assessment	3	3	3	25	75	100
	V	Extension Activities				1			50	50
				Total	180	140				3800

THIRUVALLUVAR UNIVERSITY

B.Sc. GEOLOGY

SYLLABUS

UNDER CBCS

(with effect from 2008-2009)

I SEMESTER

PAPER I

PHYSICAL AND DYNAMIC GEOLOGY

Objective

To know about the basic principles of Geology, Composition of the earth, Age of the earth, Earth's various exodynamic processes like weathering and action of geological agents and endodynamic processes like earthquake, volcanoes & tectonic process.

UNIT-I : INTRODUCTION TO GEOLOGY

The aims, methods and applications of geology as a science and its relationship with other sciences. Sub-divisions of Geology. A brief review of the various theories regarding the Origin and Age of the earth. Geological time scale.

UNIT-II : EARTH AND ITS COMPONENTS

Earth in relation to solar system, its size, shape, density, movements of the earth. Atmosphere, lithosphere and Hydrosphere. Interior of the earth:- Structure and composition of the earth's interior-crust, mantle and core.

UNIT-III : EXODYNAMIC PROCESSES I

Weathering and its types and effect on geological formations. Mechanism of erosion, transportation and deposition. Drainage pattern

UNIT-IV : EXODYNAMIC PROCESSES II

Erosion, Cycles of erosion-Rejuvenation transportation and deposition by wind, running water, underground water and of glaciers, erosional features, depositional features formed by glacial and fluvio-glacial action. Lakes: Classification of Lakes-Nature and development of Lakes-Lake deposits-Geological work of sea erosion

UNIT-V : ENDODYNAMIC PROCESSES

Earthquakes: Nature-Origin and effects of Earthquakes-Earthquake belts-Epicenter-Seismograph and seismogram. Magnitude scales- Volcanoes: Types, Products and causes of volcanism. Distribution of volcanoes.

Books Recommended

1. Arthur Holmes, (1992) *Principles of Physical Geology*, Edited by Duff.P.Mcl.D.4th Ed. Chapman and Hall, London.
2. Don Leet, & Sheldon Judson, (1960),*Physical Geology*, Prentice Hall & Co.,
3. Gorshkov,G & A.Yakushova,A (1967).*Physical Geology*, Mir publishers, Moscow
4. Jacobs,J.A R.D.Russel, and J.T.Wilson, J.T.( )*Physics and Geology,*
5. Miller, (1949) *An Introduction to Physical Geology,* East West Press Ltd.,
6. Spencer,E.V (1962), *Basic concepts of physical Geology*, Oxford & IBH, Wyllie,P.J (1971), *The Dynamic Earth*, John Wiley and Sons

ALLIED I

PAPER I

CHEMISTRY I

UNIT-I

1.1 Extraction of Metals Minerals and Ore difference - Minerals of Iron, Aluminum and Copper - Ore Dressing or concentration of Ore - Types of Ore Dressing Froth Floatation and Magnetic separation.

1.2 Refining of Metals - Types of Refining - Electrolytic, Van Arkel and Zone Refining.

1.3 Extraction of Uranium and Thorium.

UNIT - II

2.1 Cyclo-alkanes preparation properties of Cyclo-hexane -- Bayers strain theory.

2.2 Polarization - Inductive effect, mesomeric effect and steric effect - (Acid and Base strength.)

2.3 Stereo isomerism - Types, Causes of optical activity of (lactic acid) and tartaric acid - Racemisation - Resolution - Geometrical isomerism - maleic and fumaric acid.

UNIT - III

3.1 Chemical Kinetics - Distinction between Order and Molecularity - derivation of First order rate equation - half life period of first order reaction - determination of rate constant of hydrolysis of ester Catalysis - catalyst - auto catalyst - enzyme catalyst - promoters - catalytic poisoning - Active center - Distinction between homogeneous and heterogeneous catalysts - Industrial application of catalysts.

3.3 Photochemistry - Grothus Drapers law, stark einsteines law - quantum yield - photosynthesis, phosphorescence - fluorescence - chemiluminescence's - photosensitization.

UNIT - IV

4.1 VSEPR Theory - Shapes of Simple Molecules BF_3, PCl_5, SF_6 and XeF_6

4.2 Fuels - Calorific value of fuels - Non-conventional fuels - need of Solar energy - Applications - Bio-fuels.

4.3 Osmosis - Osmotic pressure - reverse osmosis - desalination of sea water.

UNIT - V

5.1 Nuclear Chemistry - Definition of Half life period - Group displacement law - Radioactive series. Nuclear Fission and Fusion - Application of nuclear chemistry in Medicine, agriculture, industries - C^{14} dating.

5.2 Crude Oil - Petroleum - Petroleum Refining - Cracking - Applications of Cracking. Naphthalene - Preparations, Properties and uses of Naphthalene - Structure of Naphthalene.

5.3 Elements of symmetry - unit cell - crystal lattice - types of cubic lattice - one example for each.

ENVIRONMENTAL STUDIES

(For all UG Degree Courses)

UNIT-I: INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL RESOURCES :

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

UNIT-II: ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION:

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem.

Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity - Insitu & Exsitu.

UNIT-III: ENVIRONMENTAL POLLUTION AND MANAGEMENT

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Land slides. Role of individuals in prevention of pollution - pollution case studies.

UNIT-IV: SOCIAL ISSUES - HUMAN POPULATION

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act - Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

UNIT-V: FIELD WORK

Visit to a local area / local polluted site / local simple ecosystem - Report submission

REFERENCES

1. KUMARASAMY, K., A.ALAGAPPA MOSES AND M.VASANTHY, 2004. ENVIRONMENTAL STUDIES, BHARATHIDSAN UNIVERSITY PUB, 1, TRICHY

2. RAJAMANNAR, 2004, ENVIRONEMNTAL STUDIES, EVR COLLEGE PUB, TRICHY

3. KALAVATHY,S. (ED.) 2004, ENVIRONMENTAL STUDIES, BISHOP HEBER COLLEGE PUB., TRICHY

II SEMESTER

PAPER II

PALEONTOLOGY

Objective

To know about the general outline of the vertebrate, invertebrate and plant fossils, their mode of preservation, classification and characters of various important phyla, morphology, distribution and geologic range.

UNIT-I : INTRODUCTION AND APPLICATION

Definition of Paleontology - Classification of animals-Habitats and Habits of animals. Definition of fossil-Nature and modes of preservation of fossils; Unaltered hard parts; Altered hard parts; petrification, permineralisation, Carbonisation, recrystallisation, silification.

UNIT-II : MOLLUSCA AND BRACHIOPODA

Phylum Mollusca: General morphology, classification, evolution and geological history of Class Pelecypoda, Gasteropoda, Cephalopoda, General morphology, classification and geological history of Phylum Brachiopoda.

UNIT-III : ECHINODERMA, ARTHROPODA AND VERTEBRATE FOSSILS

Phylum Echinodermata: General morphology, classification and Distribution of classes echinoidea, Crinoidea and Blastoidea.
Phylum Arthropoda: Class Trilobita-General morphology-classification-Distribution.

UNIT-IV : PLANT FOSSILS

A brief account of the following plant fossils: Glossopteris, Gangamopteris, Ptilophyllum, Calamites, Lepidodendron and Sigillaria.

Palynofossils: Separation technique- General morphology, brief account of spores and pollen and their geological significance.

UNIT-V : MICROPALAEONTOLOGY

Micropalaeontology:. Methods followed for the collection and separation of microfossils. Brief review of microfossil group of animal, Stratigraphic distribution of major marine microfossil groups Morphological characteristics of Foraminifera-Benthic and Planktonic foraminifera.

Books Recommended

1. Robert R.Shrock and William H., Twenhofel, (1953) Principles of Invertebrate Palaeontology Mc Graw-Hill Book CoInvertebrate Palaeontology,
2. H.Woods, Cambridge University press, 1961
3. R.C.Moore, C.G., Lalicker and A.G. Fisher, 1952. Invertebrate Fossils Mc Graw Hill Book Co., Alfred S.Romer (1963) Vertebrate Palaeontology, , University of Chicago press
4. B.U.Haq and A.Boerma, 1978, Introduction to Marine Micropalaeontology, Elsvier Publishing Company. M.D., Brasier, 1980, Microfossils, George allen & Unwin, London.
5. G.Bigot, 1985, Elements of micropalaeontology, Grahm & Trotman, London.
6. H.H.Swinerton, (1961) Outlines of Palaeontology, Edward Arnold PublisherReference Books
7. Derek V.Ager, 1963, Principles of Palaeoecology, McGraw Hill Book Co.,. Benton, M.J. 1990, Vertebrate Palaeontology, John Wiley,
8. Unwin Hyman, , 1971, Vertebrate Palaeozoology, John Wiley,
9. F.B.Phleger, Ecology and Distribution of Recent, Foraminifera;, Hohn Hopkins Press.
10. J.P.Kennet and M.S.Srinivasan; 1951, Forminifera, W.H.Freeman & Co.,

CORE PRACTICAL I

PRACTICAL 1

1. Toposheet reading : latitudes and longitudes, components of a map
2. Reading of topo - signs : settlements, bridges, railways, road and power lines, contour mapping
3. Identification of geomorphic features : mountains, valleys, slope, rivers, lakes, floodplains, estuaries, beaches, vegetation,

PRACTICAL 2

1. Identification of important mega, micro fossils of different geological time.
2. Study of important invertebrate fossils from Phylum - Molluscs, Echinodermata, Brachiopods and Arthropods.
3. Methods of separation of microfossils.

ALLIED I

PAPER II

CHEMISTRY II

UNIT-I

1.1 **Co-ordination Chemistry:**

Nomenclature of co-ordination compounds - Werner Theory of Co-ordination Compound - Chelation - Functions and structure of Haemoglobin and Chlorophyll.

1.2 **Industrial Chemistry:**

Fertilizers and manures - Bio-fertilizers- 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, gamhexane and Freon.

UNIT-II

2.1 **Carbohydrates:**

Classification - structure of glucose - Properties and uses of starch - uses of Cellulose Nitrate - Cellulose acetate.

2.2 **Amino Acid and Protein:**

Classification of Amino Acids - preparation and properties of Glycine - Classification of Protein based on Physical properties and biological functions

2.3 Primary and Secondary structures of protein (Elementary Treatment only) composition of RNA and DNA and their biological role. Tanning of leather - alum (aluminum tri chloride tanning - vegetable tanning)

UNIT-III

3.1 **Electro Chemistry:**

Specific and equivalent conductivity - their determination - effect of dilution of conductance.

3.2 Kohlrawsh Law - Determination of dissociation constant of weak Electrolyte using Conductance measurement - Conductometric Titrations

3.3 P^H and determination by indicator method - Buffer solutions - Buffer action - Importance of buffer in the living system - Derivation of Henderson equation.

UNIT-IV

4.1 Paints - Pigments - Components of Paint - Requisites of a good paint. Colour and Dyes - Classification based on constitution and application.

4.2 **Vitamins:**

Biological activities and deficiency diseases of Vitamin A, B, C, D, E and K - **Hormones** - Functions of insulin and adrenaline.

4.3 Chromatography - Principles and application of column, paper and thin layer chromatography

UNIT-V

5.1 **Drugs-** Sulpha Drugs - Uses and Mode of action of Sulpha Drugs - Antibiotics - Uses of Penicillin, Chloramphenicaol, streptomycin. Drug abuse and their implication alcohol - LSD

5.2 **Anaesthetics** - General and Local Anaesthetics - Antiseptics - Example and their application. Definition and one example each for analgesics antipyretics, tranquilizers, sedatives, causes for diabetes, cancer and AIDS.

5.3 Electrochemical corrosion and its prevention - fuel cells.

ALLIED PRACTICAL

CHEMISTRY

VOLUMETRIC ANALYSIS

1) Estimation of hydrochloric acid using std. sulphuric acid
2) Estimation of Borax using std sodium carbonate
3) Estimation of sodium hydroxide using std sodium carbonate.
4) Estimation of $FeSO_4$ using std. Mohr salt Solution.
5) Estimation of Oxalic acid using std $FeSO_4$
6) Estimation of FAS using Std oxalic acid
7) Estimation of Fe^{2+} using diphenylamine / N phenyl anthranilic acid as indicator.

ORGANIC ANALYSIS:

Reactions of aldehyde (aromatic), carbhohydrate, carboxylic acid (mono and dicarbox ylic), phenol, aromatic primary amine, amide and diamide. Systematic analysis of organic compounds containing one functional group and characterizationsss by confirmatory tests.

VALUE EDUCATION
(For all UG Degree Courses)

UNIT-I

Value Education - Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

UNIT-II

Family values - Components, structure and responsibilities of family - Neutralization of anger - Adjustability - Threats of family life - Status of women in family and society - Caring for needy and elderly - Time allotment for sharing ideas and concerns.

UNIT-III

Ethical values - Professional ethics - Mass media ethics - Advertising ethics - Influence of ethics on family life - psychology of children and youth - Leadership qualities - Personality development.

UNIT-IV

Social values - Faith, service and secularism - Social sense and commitment - Students and Politics - Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms.

UNIT-V

Effect of international affairs on values of life/ Issue of Globalization - Modern warfare - Terrorism. Environmental issues - mutual respect of different cultures, religions and their beliefs.

Reference Books

1. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
2. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.
3. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.
4. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
5. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
6. M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.

WEBSITES AND e-LEARNING SOURCES:

www.rkmissiondhe/.org/education.html/

www.clallam:;org/lifestyle/education.html/

www.sun.com/../edu/progrmws/star.html/

www.infoscouts.com

www.secretofsuccess.com

www.1millionpapers.com

http://militarlyfinance.umuc.edu/education/edu-network.html/

III SEMESTER

PAPER III

STRUCTURAL GEOLOGY

Objective

To learn about the fundamentals of structural geology, including the methods of mapping, mechanical properties and deformation structures in rocks.

UNIT-I : CONCEPTS OF STRUCTURAL MAPPING

Introduction to Structural Geology - Methods of representing physiographic features – contours - topographic and geological maps. Clinometer compass, Brunton compass, GPS and their uses in Geological mapping.

UNIT-II : ROCK ATTITUDES

Beds and their attitudes - Dip and strike - Trends of outcrops - Rule of V of outcrops - Rotation between true and apparent dips, width of outcrops; True thickness and vertical thickness and their mutual relations.

UNIT-III : FOLDS AND UNCONFORMITIES

Geometry and mechanics of folding, minor fold - origin and relation to major structure. Classification and types of folds. Shear folds and mechanics of similar folding. Salt intrusion and salt domes - Unconformities and types - Determination of top and bottom of beds.

UNIT-IV : FAULTS AND JOINTS

Study of joints - their classification and significance, Faults - Classification - types - Normal, thrust and slip faults. Mechanics of faulting. Classification and geometry of different types of shear zones. Strain variations within shear zone.

UNIT-V : FIELD RECOGNITIONS

Recognition of outcrops in the field, top and bottom of Beds, Nappe and Klippe structures. Significance of structures in rocks. Relationship of structures to

geological process. Ripple marks, Current bedding, graded bedding and torrential bedding

Books Recommended

1. Badgley, P.C., 1965, Structure and Tectonics, Harper and Row.
2. Ramsay,J.G. 1967, Folding and Fracturing of Rocks, Mc Graw Hill,

   Billings,M.P.1968, Strucutral Geology,
3. Hobbs, B.E., Means, W.D. Williams, P.F. 1976. An Outline of Structural geology, John Wiley.
4. Davis, G.R. 1984, Structural Geology of Rocks and Region, John Wiley
5. Ramsay, J.G. and Huber,M.I., 1987, Modern structural Geology Vol, I and II Academic press
6. Price N.J., and Cosgrove,J.W. 1990. Analysis of Geological structures, Cambridge Univ. Press
7. Bayly.B. 1992, Mechanics in Structural Geology, Springer and Verlag
8. Ghosh,S.K.1995, Structural Geology Fundamentals Modern Developments, Pergamon press
9. Robert R.Compton, 1962, Manual of field geology, John Wiley and sons.
10. H.W. Fairbairn, 1949, Structural petrology of deformed rocks, , Wiley press,

ALLIED II

PAPER III

PHYSICS I

UNIT-I : PROPERTIES OF MATTER

Elasticity: Hooke's law - Elastic constants - bending of beam - Bending moment - cantilever Depression at the loaded end of a cantilever - determination of Young's modulus by non-uniform bending.

Torsion: Torsion couple - Potential energy in a twisted wire - Torsional pendulum - Time period - Rigidity Modulus - Determination of rigidity modulus by Torsional oscillation (without masses).

Viscosity: viscosity of a liquid - Viscous force - Co-efficient of viscosity of a liquid - comparison of viscosities of two liquids by graduated burette method

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

UNIT-II: HEAT

Heat: Specific heat - Callender's Barne's method to determine the specific heat of a liquid-Newton's law of cooling - determination of specific heat of a liquid using Newton's law of cooling - Emissivity and Emissive power.

Low Temperature: J.K. Effect - Positive effect - Negative effect - Temperature of inversion - liquefaction of air Linde's method - Helium I and II - production of low temperature- adiabatic demagnatisation

UNIT-III : ELECTRICITY AND MAGNETISM

Electricity: Potentiometer - Principle - Calibration of low range voltmeter - Measurement of internal resistance of cell - measurement of an unknown resistance

Magnetism - Moment and pole strength of a magnet - Deflection magnetometer - Tan C position - Vibration magnetometer - Theory - period of oscillation - Determination of M and B_H using the deflection magnetometer in Tan C position and the vibration magnetometer.

UNIT-IV: SOUND AND ACOUSTICS OF BUILDING

Sound: Transverse vibration of strings - Vibration of strings - Velocity and frequency of vibrations of a stretched string - laws of vibrations along a stretched string - sonometer - A.C. Frequency - Steel wire - Brass wire

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 :GEOMETRICAL OPTICS AND PHYSICAL OPTICS

Defects of Images (Lens): Spherical aberration - minimizing spherical aberration by using two thin lenses in contact - chromatic aberration- Achromatic combination of two thin lenses in contact

Physical Optics: Interference - Air Wedge - description - Determination of diameter of a thin wire by air wedge

Diffraction: Theory of transmission grating - Normal Incidence - Determination of Wavelength of monochromatic source and Wavelength of mercury lines using a grating by normal Incidence.

Polarisation: Optical activity - specific rotatory power - Polarimeter - Determination of specific rotatory power of a solution using the polarimeter

Reference Books

1. Allied Physics - R. Murugesan S. Chand & Co. First Edition (2005)
2. Allied Physics - Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics - Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter - D.S Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics - N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound - by M. Narayanamoorthy and other National Publishing companies (1986).
7. Modern Physics - R. Murugesan S. Chand & Co.(2004)
8. Electronic Principles and applications - A. B. Bhattacharya, New Central Book Agency, Culcutta.
9. Introduction to Solid state Physics - C. Kittel, 5th Edition Wiley Eastern Ltd.
10. Renewable & sustainable energy sources - Agarwal.
11. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999)

SKILL BASED SUBJECT I

PAPER I

GEOLOGICAL MAPPING TECHNIQUES

UNIT-I : Physical Properties and Features of Rocks:

Mechanical properties of rocks-deformation - three stages - elastic, plastic and rupture. Folds: Geometry, mechanics and causes. Folding and interference pattern. Faults and Shear zone: Features associated with normal faults, strike slip faults, over thrust and napes. Joints and Veins: Analysis of joints and their tectonic significance. Minor structures - Foliation and lineation and their relation to major structures, Unconformity, recognition of top and bottom of deformed strata.

UNIT II: Structural Analysis:

Structural analysis: Principles and elements of structural analysis of simple and complex structures Field technique and interpretation. Stereographic projection - equal area projection and structural analysis - folding & fabrics. Tectonics - classification and geological significance. Stress Strain analysis and small- scale structures in folds.

UNIT-III: Concepts of Geomorphology:

Concepts of Geomorphology, Geomorphic classification of landforms: evolution of denudational – tectonic – fluvial – coastal – Aeolian – glacial – anthropogenic landforms Drainage pattern. Geomorphic cycle and their interpretation – evolution of typical geomorphic features of India.

UNIT-IV: Geolocial Mapping-I

Reading of Topographic sheets. Reconnaissance Geological Traverse, Actual Geological Mapping, Clinometer compass, Taking front and back bearing from distant objects. Measurement of pitch and plunge.

UNIT-V: Geolocial Mapping-II

Calculation of True dip and apparent dip. Estimation of Thickness, distance and depth of ore body.Width of outcrops etc. Determination of Throw/Heave/Stratigraphic separation. Strain analysis of deformed oriented rocks. Elementary structural analysis with use of stereographic methods - Interpretation of Geological and contour maps.

Reference books:

1. Billings, M.P, (1984), Structural Geology, Prentice Hall of India
2. Robert R.Compton, (1962), John Wiley & sons, Manual of field geology, INC, Newyork, London
3. Thornbury, W.S.(1969), Principles of Geomorphology, Wiley Eastern, New Delhi.
4. Dayal, P. (1990). A Text Book of Geomorphology, Shukla Book Depot, Patna.
5. Sharma, H.S. (1990), Indian Geomorphology, concept Publ.Co., New Delhi
6. Duff.P.Mcl.D. (1992), Holmes, Principles of Physical Geology, Edited by 4th Ed. Chapman and Hall, London
7. Phillips Edward, F.C. (1994). The use of Stereographic projection in Structural Geology, Arnold Publishers.
8. Ramsay, J.G., Huber , M.I., (1987), Vil.2, The Techniques of modern Geology, Folds and Fractures.

NON-MAJOR ELECTIVE I

PAPER I

FUNDAMENTALS OF GEOINFORMATICS

UNIT-I

Preparation of maps - contouring, instruments used for mapping - compass - GPS - concept of cadastral survey - Theodolite map survey - representations - terrain data, contour diagrams, relief map, geological map, drainage map - weather map etc. Compilation of base maps - map design and lay our - lettering and typology - tools and techniques for map drawing map reproduction. Computer assisted cartography.

UNIT-II

Satellite Remote sensing. Electromagnetic Radiation: Spectral Reflectance of Earth surface features in difference wavelength regions of Electromagnetic radiation. Platforms (Aerial and Satellite), Photographic and Nonphotographic systems sensors, Signal diction, Recording Scanning Mechanisms and orbiting mechanisms of satellite.

UNIT-III

Thermal Remote Sensing: Micro Wave Remote sensing - Micro wave sensors - Micro wave radiometers - Geometric Characteristics - Spatial Resolution - SLAR, SAR Satellite Altimeters - Scatterometer and Airborne Sensors. Sensors, Geometry and Radiometry of LANDSAT, SPOT, IRS Series. TERRA (ASTER-MADIS, IKONAS, ERS, ORE view meteorological and other satellites. Introduction to image processing softwares like ERDAS, ENVIS, etc.

UNIT-IV

Elements of spatial data; data sources: primary and secondary, census and sample-data; quality and error variations-raster and vector data structures data conversion-comparison of raster and vector databases-methods of spatial interpolation - GIS data

formats for the computer environment. Data capture-verification integrated analysis of spatial and attribute data, overlay analysis, neighborhood operations and connectivity functions. Remote sensing data as a data source for GIS.

UNIT-V

GIS technology - data generation and limitations - visualization in GIS - Digital Elevation Models (DEM and TINS). GIS - basic flow chart for GIS application. GIS standards, legal system. GIS as a Decision Support System. Introduction ti GIS software packages (MapInfo, Arc GIS, etc) Interpretation of Geology, Geomorphological units, Hydro geological, characters and structures, Land use pattern, soil types, environment - Town planning, Environmental Management and Emergency Response System.

Books for Study:

1. Robbinsin A.H. 1983: Elements of Cartography. John Wiley and sons, new York
2. Monkhouse F.J. & Wilkinson, K.H.R. (1994) Maps and Diagrams, Methuen, London
3. Streets, J.A. (1991) Map projections. University of London, London
4. Aronoff S. (1989) Geographic Information Systems: A Management Perspective, DDL Publication Ottawa
5. Burrough P.A. (1986) Principles of Geographic information Systems for Land Resource Assessment Oxford University Press, New York
6. Fraser Taylor D.R. (1991) Geographic information Systems. Pergamon Press, Oxford.
7. Maquire D.J.M.F.Goodchild and D.W.Rhind (eds.). Geographic information Systems: Principles and Application. Taylor & Francis, Washington, 1991.
8. Peuuquet D.J. and D.F. Marble (1990), introductory Reading in Geographic Information Systems. Taylors & Francis, Washington.

IV SEMESTER

PAPER IV

GLOBAL TECTONICS

Objectives

To understand the concepts of tectonics, different plates, mechanism of plate movements and various theories of plate tectonics. To know about the sea floor spreading and polar wandering.

UNIT-I : CONCEPT OF TECTONICS

Orogeny and epiorogeny. Theories of Mountain building and its relation to tectonism. Isostacy movements and theories. Plate tectonics and Cenozoic mountain building.

UNIT-II : MECHANISM OF PLATES

Definitions. Types of plate boundaries, Role of rotation of plates. Mechanism of movement of plates - Mantle convections -

UNIT-III : PLATE MARGINS

Convergent and Divergent plates, Rift valleys and their characteristics -Transform Faults and Transcurrent faults-Triple junction-Benioff zones.

UNIT-IV : POLAR WANDERING

Mid-oceanic ridges. Evidences of plate tectonics and Polar wandering. Theories of palaeomagnetism-Ice ages and their periodicity

UNIT-V : SEA FLOOR SPREADING

Continents and Ocean Basins-their permanence and evolution-Rethinking of earth history- Mid-oceanic ridges. Evidences of plate tectonics and Polar wandering.

Books Recommended

1. P.J.Wyllie, 1971, The Dynamic Earth, John Wiley and Sons,
2. J.A.Jacobs, R.D.Russel and J.T.Wilson., Physics and Geology
3. 1959, International Series in the Earth Sciences, Mc Graw Hill Book Co.,
4. B.F.Windley, 1978. The Evolving continents, , John Wiley & sons,
5. Allen Cox, 1973, Plate Tectonics, Freeman and company, Plate tectonics, Lee Pichon & others.
6. Moores,E and Twiss,R.J. (1995) Tectonics, Freeman
7. Keary.P. and Vine,F.J. (1990) Global Tectonics. Blackwell.

CORE PRACTICAL II

PRACTICAL 1

1. Identification of different types of folds from block models
2. Identification of different types of faults from block models
3. Calculation of apparent dip and true dip
4. Preparation of cross section profile from a geological map
5. Estimation of thickness, distance and depth of ore body/Width of outcrops etc.

PRACTICAL 2

1. Determination of Throw/Heave/Stratigraphic separation.
2. Use of stereographic Net in Geological maps and Exercises with maps related to structural Geology (three point problems, fold-doubly plunging, fault- normal and reverse, unconformity and maps with combination of structural features).

ALLIED II

PAPER IV

PHYSICS II

UNIT-I WAVE MECHANICS

Wave Mechanics - De Broglie Waves - Dual nature - Phase velocity - Group velocity-Relation between phase velocity and group velocity-Experimental study of matter waves - Davisson and Germer's experiment - G.P. Thomson's experiment - Heisenberg's uncertainty Principle - The position and momentum of a particle

UNIT-II NUCLEAR PHYSICS

Particle accelerators - cyclotron, particle detectors - GM Counter-Artificial Transmutation - Rutherford's experiment - The Q value equation for a nuclear reaction - Threshold energy - Nuclear reactions.

Conservation Laws: Conservation of Charge - Conservation of Nucleons - Conservation of Mass - Energy - Conservation of Parity - Quantities conserved and quantities not conserved in a nuclear reaction

Biological effects of radiation - control of radiation hazards.

UNIT-III : ENERGY PHYSICS

Sources of conventional energy - Need for non-conventional energy - resources - solar energy utilization - solar water heater - solar drier - conversion of light into electrical energy - solar cell - merits and demerits of solar energy - wind energy - its conversion systems - energy from Bio mass - Bio gas generation - Industrial and spaceapplication.

UNIT-IV : CRYSTALLOGRAPHY AND FIBRE OPTICS

Crystallography: The crystal structure - Unit cell - Miller indices - Reciprocal lattice vectors-properties of Reciprocal Lattice-Bragg's law-Types of bonding in crystal-crystal packing - examples of simple structures like NaCl, CaCl and Diomand.

Fiber Optics: Principle - classification of optical fibres - modes of propagation-single mode-multi mode - advantages and disadvantages. Fiber optic communication system block diagram.

UNIT-V : ELECTRONICS

Electronics: Zener diode - Characteristics - Voltage regulation using zener diode - LED - uses of LED.

Digital electronics: AND, OR NOT, NAND and NOR gates - NAND and NOR as universal building blocks - elementary ideas of Integrated circuits-Fabrication of Integrated circuits by monolithic technology - Advantages and limitations of an integrated circuit - LSI, MSI and VLSI.

Reference Books

1. Allied Physics - R. Murugesan S. Chand & Co. First Edition (2005)
2. Allied Physics - Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics - Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter - D.S Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics - N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound - by M. Narayanamoorthy and other National Publishing companies (1986).
7. Modern Physics - R. Murugesan S. Chand & Co.(2004)
8. Electronic Principles and applications - A. B. Bhattacharya, New Central Book Agency, Culcutta.
9. Introduction to Solid state Physics - C. Kittel, 5th Edition Wiley Eastern Ltd.
10. Renewable & sustainable energy sources - Agarwal.
11. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999)

ALLIED PHYSICS PRACTICALS

1. Young's Modulus - Non-uniform bending method using Pin and Microscope.
2. Rigidity modulus - Static Torsion method using Scale and Telescope.
3. Rigidity Modulus - Torsional oscillation method (without symmetric masses)
4. Comparison of co-efficient of viscosities - Burette method.
5. Specific heat capacity of a liquid - by Newton's law of cooling
6. Sonometer - Determining A.C Frequency. (Screw Gauge is given)
7. Newton's Rings - Radius of curvature.
8. Spectrometer Grating - Normal incidence - Wavelength of mercury lines.
9. Potentiometer - measurement of internal resistance of a cell
10. Potentiometer - calibration of low range voltmeter.
11. Determination of M and B_H using Deflection magnetometer in Tan C position and vibration magnetometer.
12. Figure of merit and voltage sensitiveness of galvanometer.
13. Construction of AND, OR gates using diodes and NOT by transistors.
14. Zener diode - Voltage Regulation.

SKILL BASED SUBJECT II

PAPER II

PHOTO GEOLOGY AND FUNDAMENTALS OF REMOTE SENSING

UNIT-I

Types of aerial photographs, geometry of aerial photographs, flight procedures, the significance of scale, mosaics, sources of photographs. Geologic interpretation, tone, colour, texture, landforms, drainage pattern, soil and vegetation.

UNIT-II

Use of aerial photos/images in weather forecasting - Global vegetation - climatic effects on global vegetation and desertification studies - Forest type and density.

UNIT-III

Introduction to remote sensing - Basic concepts of EMR. Electro Magnetic Radiation interaction with atmosphere-scattering - absorption - atmospheric windows; EMR interaction with Earth surface features - spectral response factors with different objects-Black body radiation.

UNIT-IV

Sensors active and passive: platforms - scanning mechanism, orbiting mechanics. Resolutions - Spectral, Spatial, radiometric and temporal. Microwave - Thermal remote sensing fundamentals. Space images and data products - IRS. Landsat, SPOT. ERS - other geostationary satellite - Space shuttle data products. Analog and digital image data product details.

UNIT-V

Spectral behavior of different soils. Mapping of soil - eroded and non eroded soil and degraded lands. Land use / Land cover interpretation. Land use planning for urban and rural areas. Role of Remote sensing in mineral exploration - Geodynamic applications.

Books Recommended

1. Miller, V.C. Photogeology, 1961, Mc Graw Hill, New York
2. Moffit, F.H. and Mikhail, E.M.(1980) photogrammetry, Harper and row.

NON-MAJOR ELECTIVE II

PAPER II

ENVIRONMENTAL AND MEDICAL GEOSCIENCE

UNIT-I

Basic principles of environmental geology, Ecological perspective - Atmosphere, hydrosphere, asthenosphere, biosphere and lithosphere, their interaction and related problems. Man's influence on Earth's energy balance, nonrenewable energy resources - alternative renewable sources.

UNIT-II

Pollution and natural hazards - volcanoes, Earthquakes, landslides, floods: Natural hazards: remedial measures. Urbanization industrialization, air pollution and public health. Coastal environment, Engineering constructions like dams, highways and reservoirs, deforestation.

UNIT-III

Water pollution - pollutant - point and non point source. Water quality standards. Sewage pollution. Solid waste disposal and environment. Impact of mining, Processing and smelting of minerals. Mining Au, FE, Cu, Pb, Zn, etc., Open cast and underground mining - overburden: gangue waste-generation, environmental impact and pollution management. Metallurgical operations - coal and fly ash, bauxite, red mud, furnace slag - waste utilization.

UNIT-IV

Medical geosciences. Human use of trace elements and health. Essential, non essential, toxic metals, and their level of exposure. Migration of elements through food chain. Impact of toxic elements to human health. Possible effects of imbalance of some trace elements.

UNIT-V

Environmental impact assessment techniques. Functional components and environmental matrix. Environmental laws and legislation in India.

Books Recommended

1. A.N. Strahler and A.H.Strahler, 1973, Environmental Geoscience, Wiley International Edition, Valdiya, K.S.1987, Environmental Geology, Indian context, Tata Mc Graw Hill
2. Edward Keller, A.Charles E, Environmental Geology, Merrill Pub. Co., A.Bell & Howell Co., London, 4th Ed.
3. Upendra Kumar Sinha, 1986, Ganga-Pollution & Health Hazard. Inter-India publication, New Delhi
4. Caria W.Mantgomary W.M. Environmental science, Narosa International

V SEMESTER

PAPER V

STRATIGRAPHY

Objectives

To learn about the geological time scale, principles of stratigraphy and the description of strata and their relationship to tectonics, climate, fossils along with their distribution in different parts of India from Precambrian to recent and geological boundary problems and applications of stratigraphy.

UNIT-I : PRINCIPLES OF STRATIGRAPHY

Principles of Stratigraphy - Stratigraphic classification - Lithostratigraphic, Biostratigraphy and chronostratigraphy. Physiographic divisions of India. Geological Time Scale - Geologic time units - correlation - physical and paleontological; Homotaxis. Imperfections in geological records.

UNIT-II : PRECAMBRIAN STRATIGRAPHY

Structure and tectonics of India- stratigraphy and economic importance of Precambrian rocks of Dharwars, Singhbhum and Aravalli - Cuddapah Basin structure and tectonics, ; Vindhyan supergroup, its sedimentation, depositional environment, primary, sedimentary structure, fossils, probable equivalents, age and economic importance.

UNIT-II : STRATIGRAPHY OF CAMBRIAN AND GONDWANA

Cambrian to carboniferous system, their distributions, geological succession and fossils. Age discussion of the Saline Series. Gondwana group-classification, geological succession, distribution, correlation, structure, sedimentation, fossils, palaeogeography and economic importance.

UNIT-IV : STRATIGRAPHY OF CENOZOIC

Triassic of Spiti-Jurassic of Kutch, their stratigraphy, classification and faunal characteristics, Cretaceous of Trichinopoly and Pondicherry, its stratigraphy, distribution and faunal characteristics, Palaeogeography of Cretaceous Period. Deccan

traps, their distribution, structural features-inter-trappean and infra-trappean beds, Lameta beds, age and economic importance.

UNIT-V : DECCAN TRAPS AND QUATERNARY GEOLOGY

Rise of Himalayas, facies and distribution. Eocene, Oligocene and Lower Miocene systems, their distribution, stratigraphy and fauna; Siwaliks-their distribution, constitution, sedimentation, climate, fossil divisions and correlation.

Books Recommended

1. Wadia,D.1973, Geology of India, Mc Graw Hill Book co.,
2. Krishnan,M.S. 1982, Geology of India and Burma, 6th Edition, CBS Publihshers and distributors.
3. Ravindra Kumar, 1985, Fundamentals of Historical Geology and Stratigraphy of India, Wiley Eastern Ltd, New Delhi.
4. Weller,J.M. 1960, Stratigraphic principles and practice, Harper & Bros, Publishers, New York.
5. Gignox,M.1960, Stratigraphic Geology, Principles of Stratigraphy, Grabau, A.W.
6. Dunbar, C.S. & Rodgers.J. 1957, Principles of Stratigraphy
7. Read,H.H., and Watson, ., 1972, Earth's History, 1, 2, Vols, London.

PAPER VI

CRYSTALLOGRAPHY

Objectives

To know about the nature, forms, habit, symmetry elements, measurement of interfacial angles and twins in crystals. The classification of crystals into system and classes.

UNIT-I : ELEMENTS OF CRYSTALLOGRAPHY

Elements of Crystallography, Crystalline, crystalline aggregates and amorphous form and nature of crystals - Pseudomorphism. Weiss and Millerian system of crystal notation.

UNIT-II : SYSTEMS AND CLASSES

Classification of crystals into systems and classes. Symmetries and classes of systems - Isometric - Tetragonal - Hexagonal.

UNIT-III : SYSTEMS AND CLASSES

Symmetries and classes of systems - Orthorhombic - Monoclinc and Triclinic

UNIT-IV : CRYSTAL FORMS

Holohedral forms - Hemihedrism - Tetratohedrism. Hemimorphic forms. Enantiomorphism - Crystal growth - Irregularities in crystals.

UNIT-V : CRYSTAL TWINS

Twins: Simple and contact twins, Interpenetration twins, polysynthetic twin. Twin laws.

Books Recommended

1. Ernest, E.Walhstrom, 1960, Optional Crystallography, John Wiley & Sons,
2. E.S.Dana, 1935 A Text Book of Mineralogy, John Wiley & Sons,
3. M.J.Buerger, 1956 Elements of Crystallography, Jophn Wiley and sons,
4. L.V.Azaroff & M.J.Buerger, 1959, The powder method, , Mc Graw Hill Book Co.
5. S.Mitra 1994, Fundamentals of Optical, Spectroscopic and X-ray Mineralogy, available at S.R.Technico Book House, Ashok Raj Path, Patna.
6. S.K.Babu and D.K.Sinha, Practical Manual of Crystal Optics, CBS Publihsers & Distributors.
7. American mineralogist special volumes on Mineralogy.

PAPER VII

MINERALOGY

Objectives

To learn about the physical and optical properties of rock forming minerals. It deals in detail about the structure, physical and chemical properties of Ortho, ring, sheet, and chain and framework silicates

UNIT-I : PHYSICAL PROPERTIES

Crystalline and amorphous substances, structure, form, cleavage, colour, luster, transparency, streak, hardness, sp.gravity, tenacity, feel, taste, odour. Electrical, Magnetic and Thermal Properites. Determination of Specific gravity method -Jolly's Spring balance method, Walker's Steel yard method, Pycnometer method. Empirical and Structural formula of minerals. Isomorphism, polymorphism and pseudomorphism, Atomic substitution and solid solution in minerals. Non-crystalline minerals. Fluorescence in minerals - Metamict state.

UNIT-II : OPTICAL PROPERTIES

Plane polarized light-Double refraction-Snells law. Optical properties of minerals: Colour, Form, Cleavage, Refractive Index, Relief, Alteration, inclusions, Zoning, Pleochroism, Pleochroic haloes, Twinkling, Isotropism and anisotropism, Extinction, Polarisation colurs, Birefringence, Twinning. .Optic sign, Uniaxial and biaxial interference figures. Primary and secondary optic axes-Optic axial angle measurements-Optic orientation-Dispersion in Crystals-Optic anomalies.

UNIT-III : ORTHO AND RING SILICATES

Physical properties, chemical composition, Classification, diagnositic properties and mode of occurrence of Ortho and Ring silicates: Olivine group, Garnet group, Alumino silicates-Epidote group, Zircon, Staurolite, Beryl, Cordierite and Tourmaline. Properties of precious and semi-precious minerals.

UNIT-IV : SHEET SILICATES AND CHAIN SILICATES

Physical properties, chemical composition, Classification,Optical and diagnositic properties and mode of occurrence of Sheet silicates and Chain silicates: Mica group, Chlorite group and clay minerals. Pyroxene group, Amphibole group.

UNIT-V : FRAME WORK SILICATES

Physical properties, chemical composition, Classification, Optical and diagnositic properties and mode of occurrence of Frame work silicates: Quartz group, Feldspar group, Feldspathoid group, Zeolite group and Scapolite group. Non-silicate-Spinel group, Carbonates and Phosphates.

Books Recommended

1. W.A.Deer, R.A.Howie and J.Zussman, 1966, An Introduction to the Rock Forming minerals, Longmans.
2. Alexander N.Winchell, 1968, Elements of Optional Mineralogy, Parts I and II, Wiley Eastern (P) Ltd.,
3. Ernest, E.Walhstrom, 1960, Optional Crystallography, John Wiley & Sons,
4. E.S.Dana, 1935, A Text Book of , Mineralogy, John Wiley & Sons.
5. L.G.Berry Mason, 1961, .Mineralogy, W.H.Freeman & Co.,
6. Kerr,B.F.,1995, Optical Mineralogy5th Ed. Mc Graw Hill, New York.
7. S.Mitra,1994, Fundamentals of Optical, Spectroscopic and X-ray Mineralogy, available at S.R.Technico Book House, Ashok Raj Path, Patna.

ELECTIVE I

PAPER I

PETROLEUM GEOLOGY

UNIT-I:

Physical properties of petroleum - origin - organic origin - nature of organic source material.

UNIT-II:

Transformation of organic matter into Kerogen, organic maturation, thermal cracking of kerogen, bacterial action - heat and pressure.

UNIT-III:

Migration and accumulation of crude oil Characters of petroleum reservoirs - reservoir and trap rocks and their classification - fluid properties - natural gas. Reservoirs - pore spaces - primary and secondary porosity - total and effective porosity, permeability - measurement of porosity, relationships between porosity and permeability - reservoir temperature and pressure.

UNIT-IV:

Sedimentary basins of India - Oil producing basins of India - oil fields of Assam, Krishna-Godavari, Cauvery, Cambay basin, Offshore oilfields - Bombay high and other potential areas and their Stratigraphy and structure - production of petroleum in India. Position of oil and natural gas in India, future prospects and the economic scenario.

UNIT-V:

Methods of petroleum exploration - surface and subsurface observations: Well logs and maps. Oil well drilling methods - basic components of an oil rotary drilling - mud circulation system and hoisting system. Well completion - zonal evaluation and production - enhanced oil recovery methods.

Books for Reference:

1. Holson, G.D. and Tirastsoo, D.H. 1985, Introduction to petroleum Geology, Gulf Pub. Houlston, Texas.
2. Tissot, B.P. and Welte, D.H. 1984, Petroleum Formation and occurrence, Springer-Verlag.
3. R.E.Chapman, 1984, Petroleum Geology, Elsevier Publishing Co.,
4. A.L.Leverson, 1972, Geology of Petroleum, Vakils, Petter and Simon Limited, Bombay.
5. E.S.Moore, 1980, Coal, John Wiley & Sons.
6. William L. Russel, 1954, Principles of Petroleum Geology, Mc Graw Hill Book Co.,
7. Bjorkee, K.O. 1989, Sedimentology and Petroleum Geology, Springer Books (India)
8. Ross C.A. 1984, Geology of Coal, Narosa Book Distributors.

SKILL BASED SUBJECT III

PAPER III

TECHNIQUES IN IDENTIFICATION OF ROCKS AND MINERALS

UNIT-I:

Crystalline and amorphous substances, structure, form, cleavage, colour, luster, transparency, streak, hardness, sp.gravity, tenacity, feel, taste, odour. Electrical, Magnetic and Thermal Properties. Empirical and Structural formula of minerals. Isomorphism, polymorphism and pseudomorphism. Non-crystalline minerals. Fluorescence in minerals.

UNIT-II:

Plane polarized light-Double refraction-Snells law. Optical properties of minerals: Colour, Form, Cleavage, Refractive Index, Relief, Alteration, inclusions, Zoning, Pleochroism, Pleochroic haloes, Twinkling, Isotropism and anisotropism, Extinction, Polarisation colours, Birefringence, Twinning.

UNIT-III:

Physical properties, chemical composition, Classification, diagnostic properties and mode of occurrence of (Ortho and Ring silicates: Olivine group, Garnet group, Alumino silicates-Epidote group, Zircon, Staurolite, Beryl, Cordierite and Tourmaline. Properties of precious and semi-precious minerals. Sheet silicates and chain silicates: Mica group, Chlorite group and clay minerals. Pyroxene group, Amphibole group and Wollastonite. Frame work silicates: Quartz group, Feldspar group, Feldspathoid group, Zeolite group and Scapolite group, Non-silicate-Spinel group, Carbonates and Phosphates.

UNIT-IV:

Megascopic identification of Quartz group, Feldspar group, Feldspathoid group. Pyroxene group, Amphibole group and important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite. Calcite, Gypsum. Metamorphic minerals: Garnet, Cordierite, Kyanite, Sillimanite, Andalusite, Sphene, Staurolite, Chondrodite.

UNIT-V:

Microscopic study of Quartz group, Feldspar group, Feldspathoid group, Pyroxene group, Amphibole group and important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite, Calcite, Gypsum. Metamorphic minerals: Garnet, Crdierite, Dyanite, Sillimanite, Andalusite, Sphene, Staurolite, Chondrodite.

Books Recommended:

1. W.A.Deer, R.A.Howie and J.Zussman, 1966, An Introduction to the Rock Forming minerals, Longmans.
2. Alexander N.Winchell, 1968, Elements of Optional Mineralogy, Parts I and II, Wiley Eastern (P) Ltd.,
3. Ernest, E.Walhstrom, 1960, Optional Crystallography, John Wiley and Sons.
4. E.S.Dana, 1935, A Text Book of Mineralogy, John Wiley & Sons.
5. L.G.Berry Mason, 1961, Mineralogy, W.H.Freeman & Co.,
6. Kerr,B.F., 1995, Optical Mineralogy 5th Ed. Mc Graw Hill, New York.
7. S.Mitra, 1994, Fundamentals of Optical, Spectroscopic and X-ray Mineralogy, S.R.Technico Book House, Ashok Raj Path, patna.

VI SEMESTER

PAPER VIII

IGNEOUS PETROLOGY

Objectives

To understand the forms, structures and textures of the intrusive nature of the igneous rocks, Crystallization, classification and petrogenesis of igneous rocks.

UNIT-I : FORMS AND STRUCTURE OF IGNEOUS ROCKS

Intrusives and their relation to geological structures - Concordant and discordant forms - Sills, Laccoliths, Dykes and cone sheets, Phaccolith -Conoliths - Batholiths - Multiple intrusions, composite intrusions. Composition and constitution of magmas. Structures and textures of igneous rocks. Micro textures and structures of igneous rocks and their petrogenetic significance.

UNIT-II : CLASSIFICATION OF IGNEOUS ROCKS

Mineralogical and chemical Classification. C.I.P.W, Niggli and Streikeisen - IUGS - Classification. Petrography of Igneous rocks - tabular classification - petrography of acid, intermediate, basic and ultrabasic rocks.

UNIT-III : FORMATION OF IGNEOUS ROCKS

Crystallization of a unicomponent magma - phase equilibria studies of binary and ternary silicate system: Albite - Anorthite systems, Diopside - Forsterite - Silica system, with reference to petrogenesis.

UNIT-IV : DIVERSITY OF IGNEOUS ROCKS

Crystallization of basaltic magma. Reaction Principle - Magmatic crystallization - differentiation - assimilation.

UNIT-V : EVOLUTION AND PETROGENESIS

Evolution of Basalts - petrogenesis of Granites, pegmatites, Alkaline rocks, Basic, Monomineralic rocks - Anorthosite, Dunites, Charnockites and Ultramafics.

Books Recommended

1. F.J.Turner & J.Verhoogen, ., 1960, Igneous and Metamorphic petrolgoy, Mc Graw Hill Book Co
2. Philipotts,A.(1992) Igneous and Metamorphic petrology, Prentice Hall.
3. Bose,M.K.1997, Igneous petrology, World press
4. Best,M.G. 1986, Igneous petrology, CBS.
5. T.F.W.Barth, 1962, Theoretical petrology, John & Wiley and sons. Principles of petrology, G.W.Tyrell, ., 1989, Methuren and Co (Students ed.)
6. H.Williams, F.J.Turner and C.M.Ghilbert, ., 1954, Petrography W.H.Freeman and Co.
7. S.R.Nockolds, R.W.O B. Knox, G.A. Chinner, 1979, Petrology for students, , Cambrige University press.
8. Daniel, S.Barkar , 1983, Igneous rocks, Prentice Hall, Englewood Cliffs, New Jersey 07632.
9. Paul C.Hess, 1989, Origin of Igneous rocks, Harvard University press, Cambridge, London, England,
10. Wernest G.Ehlers, and Harvey Blatt, 1987 Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers & Distributors, New Delhi.
11. E.E. Wahlstrom , , 1961, Theoretical Igneous petrology, John Wiley & Sons
12. Anthony Hall, 1987, Igneous petrology, ELBS Publihsers,
13. W.W. Moorhouse, 1969, The study of rocks in thin sections, Harper and sons,
14. Donald W.Hyndman, 1968, Petrology of Igneus and Metamorphic rocks, McGraw Hill Book Co., K.R. Mehnert 1968, Migmatites and the origin of granitic rocks, , Elsevier Pub. Co.,
15. E.Ranguin, , 1966, Geology of Granites, Interscience Publishers.
16. H.H. Hess and A. Poldervaart, 1967, Basalts, VolsI and II, Ed., Interscience pub.
17. Edwin Roedder, 1986, Fluid inclusions.

PAPER IX

SEDIMENTARY AND METAMORPHIC PETROLOGY

Objective

To become familiar with the petrographic nomenclature of sedimentary rocks. To learn about the occurrence, origin, classification and environments of sedimentarary rocks. To become familiar with the petrographic nomenclature of metamorphic rocks. To learn about the kinds, textures and structures, zones, grades and facies, occurrences and stability of metamorphic mineral assemblages.

UNIT-I : INTRODUCTION

Introduction to Sedimentology - Weathering and sedimentary cycle - Physical properties of particles - surface texture, particle shape, sphericity and roundmess, Particle size-Mass properties of sedimentary particles-Mineral stability and their significance. Porosity and permeability.

UNIT-II : ORIGIN AND CLASSIFICATION

Nature and origin of sedimentary rocks, Broad classification and composition of sedimentary rocks. Textures, structures and their environmental significance - Petrography of clastic and nonclastic rocks

UNIT-III : SEDIMENTARY ROCK TYPES

Types of cements, porosity, packing Lithification and Diagenesis. Petrogenesis and economic importance of Arnaceous, argillaceous and carbonaceous rocks

UNIT-IV : DEFINITION AND KINDS OF METAMORPHISM

Scope of metamorphism- Factors that controls metamorphism. Kinds of metamorphism and its products, Classification and nomenclature. Metamorphic textures and microstructures and their relation to metamorphic conditions- mineral paragenesis of metamorphic rocks. Zones, grades and facies concepts of metamorphism by Eskola- Cataclastic metamorphism and its products.

UNIT-V : PRESSURE AND TEMPERATURE AND MINERAL STABILITY.

Facies of Contact metamorphism - Mineral paragnenesis - mineral reactions - P-T conditions. Extent and facial development of contact aureoles. Facies of low temperature regional metamorphism - Facies of medium and high pressure regional metamorphism. Retrograde metamorphism

Books Recommended

1. Friedman, G.M., Sanders, 1978, Principles of Sedimentalogy, , E.J.John Wiley and sons, New York, Allen J,R.L., 1985., Principles of physical sedimentation, George4 Allen & Unwin.
2. Nichols, H. G.1999, Sedimentary environments, Blackwell
3. Einsele, G.1992, Sedimentary basins, , Springer Verlag.
4. Pettijohn, F.J. Potter,P.E., and Siever, R. 1990, Sand and sandstone. Springer-Verlag.
5. Wilson, J.L. , 1975, Carbonate facies in geological history, Springer verlag, New York.
6. F.J.Pettijohn, 1975, Sedimentary rocks, Harper & Bros. 3rd Ed.
7. Richard C. Shelley, 1992, Applied Sedimentology, Academic press, New york,
8. Sengupta.S. 1997, Introduction to sedimentologyh Oxford-IBH.
9. Bhattacharya, A and Chakraborth,C. 2000, Analysis of sedimentary successions, Oxford-IBH.
10. F.H.Hatch, R.H.Rastall, 1941, .Petrology of Sedimentary rocksThomas Murby & Co.,
11. W.H.Twenhofel and S.A. Tayler, 1941, Methods of Study of sediments, Mc Graw Hill Book Co.,
12. Collison,J.D., & Thompson,D.B, 1989,.Sedimentary structures,. 2nd Ed. Unwin Hyman, London.
13. M.E. Tucker, & V.P. Wright, 1990 Carbonate sedimentology, , Macwell Scientific Publication, London,
14. F.J.Turner & J.Verhoogen, 1960. Igneous and Metamorphic petrolgoy, Mc Graw Hill Book Co.,
15. Turner,F.J. 1980, Metamorphic petrology, Mc Graw Hill,
16. Yardley, BN.W. 1989, An introduction to Metamorphic petrology. Longman, New york.
17. Butcher,K. and Frey,M. (1994) Petrogenesis of metamorphic rocks, Springer Verlag.
18. Kretz,R.1994 Metamorphic crystallization, John Wiley.
19. G.W.Tyrell, 1989, Principles of petrology, Methuren and Co., (Students ed.)
20. Bhaskar Rao, 1986, Metamorphic petrology, International Book House, Second Ed. 12, U.B. Bangalow Road, Delhi-110 007.

21. Barker, A.J. 1989., Introduction to metamorphic textures and microstructures, Chapman and Hill, Ernest gy, Igneous, Sedimentary and Metamorphic G.Ehlers, and Harvey Blatt Petrolo rocks, CBS Publishers & Distributors, New Delhi.
22. W.W. Moorhouse, 1969.,The study of rocks in thin sections, Harper and sons,

PAPER X

ECONOMIC GEOLOGY

Objective

To learn about geology of the non metallic minerals and their industrial applications, distribution and mode of occurrences. To gain knowledge about the mines legislation of India, National mineral policy, and their role in National economy.

UNIT-I : INTRODUCTION TO MINERAL WEALTH

Introduction to Geology of Industrial minerals and rocks. Strategic, Critical and essential minerals. Mineral based Industries in India. Geology, Mode of Occurrence and Origin of the raw materials of the following Industries: Refractory, Abrasives.

UNIT-II : OREGENESIS

Process of mineral formation - primary and secondary process: brief outline of magmatic, sublimate, contact metasomatic, hydrothermal, metasomatic replacement, sedimentary: evaporate, placer deposits, residual oxidation and supergene enrichment and metamorphic deposits. Classification of mineral deposits - controls of ore localization.

UNIT-III : MODE OF OCCURRENCE AND DISTRIBUTION OF INDUSTRIAL MINERALS

Study of the following economic minerals of India such as ceramic materials, Construction materials-cement raw materials-mineral pigments, asbestos, mica and fullers earth- their mode of occurrence, distribution in India, and origin.

UNIT-IV : MODE OF OCCURRENCE AND DISTRIBUTION OF ECONOMIC MINERALS AND FOSSIL FUELS

Study of the following economic minerals of India in Mineral fertilizers: Geology, Source, Uses, Production and distribution of Potash, Nitrates, Phosphates, Gypsum, Lime, Sulphur, and minor fertilizer minerals. Mode of occurrence, Origin and distribution of Limestone - Gypsum Origin distribution and occurrence of Coal, Petroleum and Natural gas. Mineral wealth of Tamilnadu and India.

UNIT-V : MINING METHODS

Introduction to Minning methods. Drilling methods and types of drills. Mine explosives and magazines. open cast mining - Bench parameters - haulage layouts.. Alluvial mining. Underground mine layouts- shaft, adit, winze, raise and stope. Ventilation and illumination. Underground mining of coal. Underground mine fire, causes, effects and prevention .

Books Recommended

1. Alan M.Bateman , 1961, Economic mineral deposits, Asia Publishing House, Mining Geology, H.E. Mc Kinstry, Asia publishing house, 1960.
2. S.Deb, ., 1980, Industrial minerals and Rocks of India, Allied Publishers Pvt. Ltd.
3. K.V.G.K.Gkhale and T.G. Rao, 1972, Ore deposits of India, Thompson press Ltd., Delhi - 6, Indias S.Krishnaswamy , 1972, Mineral Resources, , Oxford and IBH Publishing Co.,
4. J.Coggin Brown & A.K.Dey, 1955, India's Mineral Wealth, Oxford University Press,
5. W.Lindgren, 1933, Mineral deposits, Mc Graw Hill Book Co.,
6. N.K.N.Aiyengar, 1964, Minerals of Madras, Dept. of Industries and Commerce, Madras

CORE PRACTICAL III

1. To develop skill and abilities in the identification of crystals of different systems, class, forms & symmetry elements by using crystal models.
2. To develop skill and abilities in the identification of rocks with their texture, mineralogy and genesis both in hand specimen and thin sections.

   a. Megascopic identification of important igneous, metamorphic and sedimentary rocks.
   b. Microscopic identification of rock fabrics, mineral assemblages of igneous, metamorphic and sedimentary rocks.

CORE PRACTICAL IV

1. Megascopic identification of Quartz group, Feldspar group, Feldspathoid group, Pyroxene group, Amphibole group and other important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite. Calcite, Gypsum. Metamorphic minerals: Garnet, Cordierite, Kyanite, Sillimanite, Andalusite, Sphene, Staurolite, Chondrodite.

   Microscopic study of Quartz group, Feldspar group, Feldspathoid group, Pyroxene group, Amphibole group and important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite. Calcite, Gypsum. Metamorphic minerals: Garnet, Cordierite, Kyanite, Sillimanite, Andalusite, Sphene, Staurolite, Chondrodite.

2. Megascopic study and description of important ores and other economic minerals- Oxides, Sulphides, Sulphats, Phosphates, Carbonates, Halides and Nitrates etc., Study and identification of megascopic rock - ore/mineral associations. Ultrabasics and associated ore minerals - chromite, magnetite, niccolite, serpentine, magnesite. Sulphide ores and various associations - chalco pyrite, pyrite, sphalerite, galena,bornite, azurite, malachite. Pegmatites and associatied ore minerals - micas, cassiterite, apatite,etc. Sedimentary ore deposits: manganese, hematite, phosphates. Placer minerals - monozite, ilmenite, rutile,magnetite, garnet, zircon, etc. Decorative stones - granites, charnockites, leptynite, dolerite, calc granulite, Khondalite, syenite and slate.

ELECTIVE II

PAPER II

GEOGRAPHIC INFORMATION SYSTEM (GIS)

UNIT-I:

Geographic information system-concepts-data structure: GIS Hardware and software component. Polygon structures-Arc node-animation-simulation-digitization-Manual methods.

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 and soils. Geological.

Books Recommended:

1. Anji Ready.M 2000 Remote Sensing and Geographic Information systems. Book syndicate publishing company, Hyderabad.
2. Heywood 2000 An Introduction to Geographical Information system, Longman Ltd, New York. Burrow, 1982, GIS, Introductory spatial analysis, London.

3. Goodchild,M.F. Parks, Steyaeart, L.T. 1993 (Eds.) Environmental Modeling with GIS, Oxford University Press.
4. Hearnshaw, H.M. Unwin,D.J. 1994, Visualisation in Geographical information systems, New York.
5. Laurini,R. Thompson.D, 1992, Fundamentals of Spatial Information Systems, Academic Press, London.
6. Wood Harper A.T., Antill, L. Avison,D.E. 1995, Information System, Definition: the multiview approach, Black well Scientific, Oxford.
7. Zeiler,M. 1994, Inside ARC/INFO. Onword Press, USA.

ELECTIVE III

PAPER III

GEMOLOGY

UNIT-I:

Nature of gemstones: Gems as inorganic and organic natural products possessing special qualities (beauty rarity, durability). Formation of minerals and rocks. Crystalline and amorphous materials. Cryptocrystalline, massive and metamict states.

UNIT-II:

Physical properties, Hardness: Definition, Mohs scale, selection of reference minerals, application in Gemology. Specific gravity: definition, determination, hydrostatic weighing using two-pan and single-pan balance, heavy liquids (bromoform, methylene iodide and Clerici solution), flotation and pycnometer method. Magnetic and electrical properties, thermal conductivity and thermal conductivity meter.

UNIT-III:

Optical Properties: Nature of colour: absorption of light, differential absorption of light, pleochroism, Luster, sheen, in gemstones. Refraction: laws of reflection, importance in gemology, refractive index, total internal reflection, Cleavage: definition, description, importance in gemology. Internal feature of gemstones: inclusions, colour zoning.

UNIT-IV:

Synthesis of gemstones: Methods of manufacture: flame-fusion (Vernueil), flux-melt, hydrothermal, crystal-pulling (Czochralski), skull-melting method, belt and tetrapod methods. Manufacture and identification of synthetic diamond, corundum, emeralds aloxandrite, quartz, opal, rutile, turquoise, coral, lapis lazuli, strontium titanate and cubic zirconia. Units of Measurement: Metric carat, pearl grain, kilogram, gram, milligram, meter millimeter, micrometer, nanometer, Angstrom, liter, milli-liter.

UNIT-V:

Artificial alteration of gemstones: Illustrated descriptions of the principal types of cuts including brilliant, step, mixed, rose, cabochon, scissors (cross). Ideal proportions for diamond brilliant cut. Outlines of methods used by diamond-cutters and lapidaries.

Books Recommended:

1. By P.G. Read. 1986, Beginner's Guide to Gemology
2. R.Webstar 1994, Practical Gemology
3. S.W.Anderson 1981, Gem Testing
4. W.Schumann 1974, Gemstones of the World.
5. David & Charles, 1982, Practical Gem cutting
6. Karnath K.V. 1989, Gem and Gem Industry in India, Geo. Soc. Publish, Bangalore.

SKILL BASED SUBJECT IV

PAPER IV

WATER QUALITY ANALYSIS AND ASSESSMENT

UNIT-I:

Various chemical parameters and classification of groundwater - Water sampling - Interpretation of chemical, physical and bacterial analysis.

UNIT-II:

Methods of water collection and preparation for of samples for analysis. Analysis of major and minor elements. Analytical techniques - Claorimetric - Flame photometric, Emission Spectrometric and Atomic Absorption Spectro photometric methods.

UNIT-III:

ISI and WHO standards for drinking, irrigation and industrial quality - Treatment methods for improving quality.

UNIT-IV:

Pollution of groundwater by agricultural and chemical industries - Pollution control – Prevention and control of salt water intrusion.

UNIT-V:

Statutory controls of recharged groundwater - need for groundwater regulations and law.

Books for Reference:

1. Hydrogeology, Davies and De Weist, John Wiley & Sons 1965.
2. Groundwater Hydrology, Todd.D.K. 1988, John Wiley & Sons.
3. Groundwater Management, K.R.Karanth, S.R.Technico Book House, Ashokrajpath, Patna-800 006.
4. H.M.Ragunath, 1983, Ground water, John Wiely & Sons Ground water and wells, 2nd Ed.
5. Dr.B.D.Patak, 1988, Hydrogeology of India, Central Board Irrigation and power, Mecha Marg, Chanakayapuri, New Delhi.

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