

THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

B.Sc. GEOLOGY

DEGREE COURSE

CBCS PATTERN

(With effect from 2012-2013)

The Course of Study and the Scheme of Examinations

S.NO	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
SEMESTER I									
1	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2	II	English	Paper-1	6	4	English	25	75	100
3	III	Core Theory	Paper-1	6	5	Physical and Dynamic Geology	25	75	100
4	III	Core Practical	Practical	3	0	Palaeontology	0	0	0
5	III	ALLIED -1	Paper-1	4	4	Chemistry I	15	60	75
6	III	Allied Practical	Practical-1	3	0	Chemistry I	0	0	0
7	IV	Environ. Studies		2	2	Environmental Studies	10	40	50
				30	19		100	325	425
SEMESTER II									
8	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9	II	English	Paper-2	4	4	English	25	75	100
10	III	Core Theory	Paper-2	6	5	Palaeontology	25	75	100
11	III	Core Practical	Practical-1	3	3	Palaeontology	40	60	100
12	III	ALLIED-1	Paper-2	4	4	Chemistry II	15	60	75
13	III	Allied Practical	Practical-1	3	2	Chemistry II	10	40	50
14	IV	Value Education		2	2	Value Education	10	40	50
15	IV	Soft Skill		2	1	Soft Skill	10	40	50
				30	25		160	465	625

B.Sc. Geology: Syllabus (CBCS)

SEMESTER III							CIA	Uni. Exam	Total
16	I	Language	Paper-3	6	4	Tamil/Other Languages	25	75	100
17	II	English	Paper-3	6	4	English	25	75	100
18	III	Core Theory	Paper-3	3	3	Structural Geology	25	75	100
19	III	Core Practical	Practical-2	3	0	Structural Geology	0	0	0
20	III	ALLIED-2	Paper-3	4	4	Physics I	15	60	75
21	III	Allied Practical	Practical-2	3	0	Physics I	0	0	0
22	IV	Skill based Subject	Paper-1	3	3	Hydrogeology	15	60	75
23	IV	Non-major elective	Paper-1	2	2	Natural Disaster Management	10	40	50
				30	20		115	385	500
SEMESTER IV							CIA	Uni. Exam	Total
24	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100
25	II	English	Paper-4	6	4	English	25	75	100
26	III	Core Theory	Paper-4	3	3	Geomorphology	25	75	100
27		Core Practical	Practical-2	3	3	Structural Geology	40	60	100
28	III	ALLIED-2	Paper-4	4	4	Physics II	15	60	75
29	III	Allied Practical-2	Practical-2	3	2	Physics II	10	40	50
30	IV	Skill based Subject	Paper-2	3	3	Field Geology	15	60	75
31	IV	Non-major elective	Paper-2	2	2	Environmental Geology	10	40	50
				30	25		165	485	650
SEMESTER V							CIA	Uni. Exam	Total
32	III	Core Theory	Paper-5	6	5	Stratigraphy	25	75	100
33	III	Core Theory	Paper-6	6	5	Crystallography	25	75	100
34	III	Core Theory	Paper-7	6	5	Mineralogy	25	75	100
35	III	Core Practical	Practical-3	3	0	Crystallography and Mineralogy	0	0	0
36	III	Core Practical	Practical-4	3	0	Petrology and Economic Geology	0	0	0
37	III	Elective	Paper-1	3	3	Engineering and Mining Geology	25	75	100
38	IV	Skill based Subject	Paper-3	3	3	Photogeology and Fundamentals of Remotesensing	15	60	75
				30	21		115	360	475

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SEMESTER VI							CIA	Uni. Exam	Total
39	III	Core Theory	Paper-8	5	5	Igneous Petrology	25	75	100
40	III	Core Theory	Paper-9	5	5	Sedimentary Petrology	25	75	100
41	III	Core Theory	Paper-10	5	4	Economic Geology	25	75	100
42	III	Core Practical	Practical-3	3	3	Crystallography and Mineralogy	40	60	100
43	III	Core Practical	Practical-4	3	3	Petrology and Economic Geology	40	60	100
44	III	Elective	Paper-2	3	3	Geographical Information System	25	75	100
45	III	Elective	Paper-3	3	3	Environmental and Marine Geology	25	75	100
46	IV	Skill based Subject	Paper-4	3	3	Mineral Exploration	15	60	75
47	V	Extension Activities		0	1		50	0	50
				30	30		270	555	825

Part	Subject	Papers	Credit	Total credits	Marks	Total marks
Part I	Languages	4	4	16	100	400
Part II	English	4	4	16	100	400
Part III	Allied (Odd Sem)	2	4	8	75	150
	Allied (Even Sem)	2	4	8	75	150
	Allied -Prac(Even Sem)	2	2	4	50	100
	Electives	3	3	9	100	300
	Core	10	(3-7)	45	100	1000
	Core Practical	4	3	12	100	400
Part IV	Env. Science	1	2	2	50	50
	Soft skill)	1	1	1	50	50
	Value Education	1	2	2	50	50
	Lang. & Others/NME	2	2	4	50	100
	Skill Based	4	3	12	75	300
Part V	Extension	1	1	1	50	50
	Total	41		140		3500

THIRUVALLUVAR UNIVERSITY

B.Sc. GEOLOGY

SYLLABUS

CBCS PATTERN

(With effect from 2012-2013)

SEMESTER I

PAPER - 1

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

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

UNIT-IV: 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.

UNIT –V: CONCEPT OF TECTONICS

Orogeny and epiorogeny. theories of mountain building. isostasy movements and theories. Plates. Definitions. Types of plate boundaries. mechanism of movement of plates - mantle convections. Plate margins convergent and divergent plates, rift valleys and their characteristics -transform faults and transcurrent faults-triple junction-benioff zones.

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 – 1

PAPER – 1

CHEMISTRY – I

UNIT-I

- 1.1 Extraction of Metals – Minerals and Ores – 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 Thorium.

UNIT-II

- 2.1 Preparation and Properties of Cyclohexane. Baeyer Strain Theory.
- 2.2 Polar Effects – Inductive effect, mesomeric effect and steric effect. (Acid and Base Strength).
- 2.3 Stereoisomerism – Types, Causes of optical activity of lactic acid and tartaric acid . 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 reactions.
- 3.2 Catalysis – Catalyst – auto catalyst – enzyme catalyst – promoters – catalytic poisoning – Active center – Distinction between homogeneous and Heterogeneous catalysis – Industrial applications of catalyst.
- 3.3 Photochemistry – Grothus Drapers law, Stark Einstein's law – quantum yield – photosynthesis, phosphorescence, fluorescence – chemiluminescence – photosensitization.

UNIT-IV

- 4.1 VSEPR Theory – Shapes of simple molecules BF_3 , PCl_3 , 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 – Preparation – Properties and uses of Naphthalene.
- 5.3 Elements of Symmetry – Unit cell – Crystal lattice – types of cubic lattice – one example each.

SEMESTER II
PAPER - 2
PALAEONTOLOGY

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 Co. Invertebrate 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, Elsevier Publishing Company. M.D., Brasier, 1980, Microfossils, George Allen & Unwin, London.
5. G. Bigot, 1985, Elements of micropalaeontology, Graham & Trotman, London.
6. H.H. Swinerton, (1961) Publisher Reference Books
7. Derek V. Ager, 1963, Principles of Palaeoecology, McGraw Hill Book Co.,.
8. Outlines of Palaeontology, Edward Arnold Benton, M.J. 1990, Vertebrate Palaeontology, John Wiley,
9. Unwin Hyman, , 1971, Vertebrate Palaeozoology, John Wiley,
10. F.B. Phleger, Ecology and Distribution of Recent, Foraminifera;, Hohn Hopkins Press.
11. J.P. Kennet and M.S. Srinivasan; 1951, Foraminifera, W.H. Freeman & Co.,

CORE PRACTICAL I

PALAEONTOLOGY

Identification of important mega, micro fossils of different geological time.

Study of important invertebrate fossils from Phylum - Molluscs, Echinodermata, Brachiopods and Arthropods.

ALLIED - 1
PAPER - 2
CHEMISTRY – II

UNIT-I: Co-ordination Chemistry

- 1.1 Nomenclature of Coordination Compounds - Werner Theory of Coordination Compounds – Chelation – Functions and structure of haemoglobin and chlorophyll.
- 1.2 Industrial Chemistry:
Fertilizers and manures – Bio fertilizer – Manures and their importance – Role of NPK in plants – preparations and uses of urea, Ammonium nitrate, Potassium nitrate and super phosphate of lime.
- 1.3 Contents in Match sticks and match box – industrial making of safety matches. Preparation and uses of chloroform, DDT, gammexane and Freon.

UNIT-II: Carbohydrates

- 2.1 Classification – structure of glucose – properties and uses of starch – uses of Cellulose nitrate – Cellulose acetate.
- 2.2 Amino Acids and Proteins
Classification of amino acids – preparation and properties of Glycine – Classification of proteins based on physical properties and biological functions.
- 2.3 Primary and Secondary structure of protein (Elementary treatment only) composition of RNA and DNA and their biological role. Tanning of leather –alum (aluminum trichloride tanning –Vegetable tanning)

UNIT-III: Electrochemistry

- 3.1 Specific and equivalent conductivity their determination – effect of dilution on conductance.
- 3.2 Kohlrausch 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 paints - 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 and K – Hormones – Functions of insulin and adrenaline.

- 4.3 Chromatography –Principles and applications of column, paper and thin layer chromatography.

UNIT-V

- 1.1 Drugs – Sulpha drugs Uses and mode of action of sulpha drugs – Antibiotics – Uses of Penicillin, Chloroamphenicols, streptomycin. Drug abuse and their implication- alcohol –LSD
- 1.2 Anaesthetics – General and local anaesthetics – Antiseptics – Example and their application. Definition and one example each for analgesics, antipyretics, tranquillizers, sedatives, causes of diabetes, cancer and Aids.
- 5.3 Electrochemical Corrosion and its prevention.

ALLIED CHEMISTRY

PRACTICAL - 1

VOLUMETRIC ANALYSIS

1. Estimation of hydrochloric acid using standard sulphuric acid.
2. Estimation of Borax using standard sodium carbonate.
3. Estimation of FeSO_4 using standard Mohr salt solution.
4. Estimation of Oxalic acid using standard FeSO_4 .
5. Estimation of $\text{K}_2\text{Cr}_2\text{O}_7$ using standard $\text{K}_2\text{Cr}_2\text{O}_7$.
6. Estimation of Copper using standard copper sulphate.
7. Estimation of Fe^{2+} using diphenylamine / N-Phenyl anthranilic acid as indicator
Students must write the short procedure for the given Estimation in the examination and submit the paper for evaluation.

ORGANIC ANALYSIS

Reactions of Aldehyde (aromatic), Carbohydrate, Carboxylic acid (mono and dicarboxylic acid) , Phenol, Aromatic primary amine, Amide, and Diamide. Systematic Analysis of Organic compounds containing one functional group and characterization of confirmatory tests.

SEMESTER III

PAPER - 3

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

Properties of matter-Types of forces. Attitude of beds - Dip and strike - Trends of outcrops - Rule of V of outcrops

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.

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, Structural 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,

SKILL BASED SUBJECT

PAPER – 1

HYDRO GEOLOGY

Unit – I

Definition of Hydrology and Hydrogeology- Groundwater in Hydrologic cycle – Origin of Groundwater: - Meteoric water, Connate water, Magmatic water, Juvenile water, Metamorphic water; water bearing formations:- Aquifers, Aquiclude, Aquifuge, Aquitard; Types of Aquifers:- Unconfined aquifer, Confined aquifers, Leaky aquifer. Vertical distribution of groundwater:- Water Table, Zone of Aeration, Zone of Saturation. Springs, Artesian well and Piezometric surface.

Unit – II

Aquifer properties and Groundwater flow:- Porosity, Soil classification based on particle size, Specific yield, Specific retention; Determination of specific yield:- Laboratory methods, Field methods: Storage coefficient of permeability, Laboratory measurement of permeability – Constant head permeameter – falling head permeameter;

Unit – III

Groundwater investigation:- Electrical resistivity method – Wenner’s electrode arrangement-Schlumberger’s electrode arrangement;

Unit – IV

Groundwater Quality:- Analysis of groundwater Hydrogen ion concentration (PH) – Total dissolved solids (TDS) - Specific conductance – Hardness – Mineral characteristics – Expression of analysis:- cations, anions.

Unit – V

Groundwater Recharge:- Recharge methods - Basin method, Stream channel method, Ditch or Furrow method, Flooding method, Irrigation method, Pit method, Recharge well method. Rainwater Harvesting systems.

NON-MAJOR ELECTIVE

PAPER - 1

NATURAL DISASTER MANAGEMENT

UNIT-I: Introduction

Components of Environment: Atmosphere, Lithosphere, Hydrosphere and Biosphere – Their interactions and related problems. Emerging approaches in Disaster Management- Three Stages: 1. Pre-disaster stage (preparedness); 2. Emergency Stage and 3. Post Disaster stage- Rehabilitation - Political Administrative Aspect, Social Aspect, Economic Aspect, Environmental Aspect.

UNIT-II: Atmospheric and Forest Related Disaster

Greenhouse effect, greenhouse gases and climate, characteristics of climate problems, radiation budget and climate change, greenhouse effect and destruction of ozone layer, present status of ozone layer. Deforestation - causes of deforestation, effect of global climatic change.

UNIT-III: Geological Mass Movement and Land Disasters

Earthquake, earthquake scales, magnitude and intensity, perception and prediction of earthquake, earthquake prone areas, case studies from India, forecasting techniques and risk analysis. Volcanism, description of phenomenon, monitoring and warning. Landslides, rock falls, avalanches, mud flows, and glaciers, landslides and rock falls techniques for reducing landslide hazards.

UNIT-IV: Wind-Water driven

Desertification: responses, deserts, impact on agriculture. Tropical cyclones: aerial extent of cyclone hazard potential, El-nino/non-El-nino contrast in the tropical cyclone. Floods, intensification of hazards due to human interference, Hurricanes, tornados. Tsunamis – causes and effects. Sealevel rise and its impact

UNIT-V: Disaster Management

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations. Environmental policies & programmes in India- Institutions & National Centres for Natural Disaster reduction. Environmental Legislations in India.

SEMESTER IV

PAPER - 4

GEOMORPHOLOGY

UNIT-I

Definition of Geomorphic agent, gradation, degradation and aggradation. Concepts of Geomorphology. Weathering –definition of processes, climatic influences and products. Soil types of India.

UNIT-II

The atmosphere, its composition and zones. Geological work and landforms produced by wind. Sand dunes and their types. Groundwater, Springs – artesian wells – Hot springs and Geysers. Geological work and landforms produced by groundwater. Karst topography.

UNIT-III

Running water – sources; Geological work and landforms produced. Base level of erosion – graded profile – Rapids, cascades and water falls. Development of river valleys. Drainage patterns. River capture, meandering, streams - rejuvenation, river terraces, entrenched meanders, braided streams, drainage pattern.

UNIT-IV

Glaciers, Definition; origin of glacial ice – types of glaciers and their movement. Glacial wastage – ablation and calving, icebergs. Geological action and landforms produced. A brief outline on glacial epochs and causes of glaciations.

UNIT-V

Seas and oceans – definition of continental margins – continental shelf, continental slope, continental rise; abyssal plain. Waves, tides and currents. Coastal erosion, deposition and resulting landforms. Shorelines – types of shorelines. A brief account on submarine canyons, sea mounts, guyots and mid oceanic ridges. Coral reefs, types and origin. Lakes; Origin and classification of lakes. Indian lakes and lake deposits.

Books for study and reference

1. Holmes. A – Principles of Physical Geology, Thomas Wilson and Sons
2. Strauhler, N – Earth Science, Harper and Rowl.
3. Thornbury, W – Principles of Geomorphology, Wiley Eastern
4. Leet, Judson and Kauffman – Physical Geology, Prentice Hall
5. Miller, W.J – an introduction to Physical Geology, Van Nostrand.
6. Worcester, P.G. - A text book of Geomorphology, Van Nostrand
7. Mehta – Physical Geology – Harichand Mehta, Kashmir.

CORE PRACTICAL-2

SATUCTURAL GEOLOGY

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 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.

SKILL BASED SUBJECT

PAPER - 2

FIELD GEOLOGY

UNIT-I

Importance of field geology – tasks of field geologist – field equipments – places of importance for the field geologist – where to look for outcrops, fossils & other geological features. Pitting & trenching the ore bodies, Drilling- types and uses, estimation of ore reserves.

UNIT-II

Topographic features, methods of representing topography on maps – detailed study of contouring – dip – true dip and apparent dip, their relationship strike. Influence of dip and ground slope on outcrops.

UNIT-III

True thickness and vertical thickness of beds, their measurement in the field, relationships between true thickness and vertical thickness their calculation from field data. Conditions that bring about repetition of outcrops.

UNIT-IV

Sampling – definition of a sample – sample requirement as to the size, purity contamination, packing etc. Important methods of sampling – car samples, muck samples, channel samples, grit samples, chip samples, drill hole sampling or core sampling. Coning and quartering. Methods of preparation of geological report.

UNIT-V

Topographic map – details, printed on the map, cardinal points (directions) conventional signs, scale of map, map references (indexing), orienting the map, locating the position of outcrops on a map, plotting attitude of beds, symbols used for rock types & various structural features – an outline of preparation of geological map.

Book for study and references

1. Field geology, F.H.Lahee, McGraw Hill, Publishers.
2. Interpretation of topographic maps, C.L.Dake & C.S.Brown.
3. Elements of field geology, G.W.Himus & G.S.Sweeting
4. Structural and Field Geology, J.Geikie, Oliver and Boyd Publishers.
5. Field Geology, R.R. Compton, Wiley Publishers.
6. Geological Maps, G.W.Chiplonker, Dastane Bros., Pune.
7. Landforms and topographic maps, W.B.Upton, John Wiley Publishers.
8. Structural Geology, M.P.Billings, Prentice – Hall India Ltd.

NON-MAJOR ELECTIVE

PAPER - 2

ENVIRONMENTAL GEOLOGY

UNIT-I

Basic principles of environmental geology, Ecological perspective - Atmosphere, hydrosphere, asthenosphere, biosphere and lithosphere, their interaction and related problems.

UNIT-II

Man's influence on Earth's energy balance, nonrenewable energy resources - alternative renewable sources.

Man's impact on Environment:

Urbanisation. Industrialization, Engineering constructions like dams, highways and reservoirs, and deforestation.

UNIT-III

Air pollution:

Sources, Management, Impact Assessment, Air quality Standards.

UNIT-IV

Water pollution - pollutant - point and non point source. Water quality standards. Sewage pollution. Solid waste disposal and environment.

UNIT-V

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. 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.

Books for study and reference

1. Valdiya, K.S (1987), Environmental Geology – Indian Context. Tata McGraw-Hill., New Delhi.
2. Kellar, E.A. 1979, Environmental Geology, Charles. Merrill Publishing Co. Ohio.
3. Lundgren, I. 1986, Environmental Geology, Prentice Hall.

SEMESTER V
PAPER-5
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 Dharwar, 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, 6 Edition, CBS Publihsers and th 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-6
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 - Monoclinic and Triclinic

UNIT-IV : CRYSTAL FORMS

Holohedral forms - Hemihedrism - Tetrahedrism. 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. Walstrom, 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*, John 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 Publishers & Distributors.
7. American mineralogist special volumes on Mineralogy.

PAPER - 7
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 Properties. 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 colours, 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, 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.

UNIT-IV : SHEET SILICATES AND CHAIN SILICATES

Physical properties, chemical composition, Classification,Optical and diagnostic 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 diagnostic 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 Optical Mineralogy, Parts I and II, Wiley Eastern (P) Ltd.,
3. Ernest, E.Walhstrom, 1960, Optical 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

PAPER - 1

ENGINEERING AND MINING GEOLOGY

Unit – I

Introduction to Engineering Geology: Engineering properties of rocks, Rock discontinuities, Physical characters of building, ornamental stones and Concrete aggregates. Dams and Reservoirs – Types of dams – Dam sites. Relative suitability of different rocks – Geological investigation in dam sites.

Unit – II

Tunneling – Types, Methods of geological investigation. Road – complicated regions for Roads. Geological problems after road construction – improvement of sites – soil stabilization. Geological investigation on landslides.

Unit – III

Sampling – Principles – types – collection of sample – core samples and their preservation. Drilling – brief account of different types of drilling – Geological logging of borehole samples.

Unit – IV

Methods of breaking rocks – A short note on explosives. Surface mining open cast. Alluvial mining: Panning – Slucing – Hydraulicking – Dredging - mine support and stoping – shaft sinking.

Unit – V

Subsurface mining: Criteria to choose subsurface mining, Definition of mining terms: Shaft, Level, Adit, Hanging wall, Footwall, Drive, Cross cut, Tunnel, Raise, Winze and Chute. Stoping – Open stopes – Supported stopes – pillar – Square set filled – Shrinkage stopes, Glory hole mining. Caving methods: Top slicing, Sub level caving, Block caving, Coal mining, Prospecting and Planning – Strip mining – Augering – Room and Pillar method – Long wall method.

Book for study and reference

- 1). R.N.P. Arogyasamy, Courses in mining Geology, Oxford & IBH Publishing Co.
- 2). Mckinstry- Mining Geology.
- 3). Krynine, D.P. and Judd, W.R. Principles of Engineering Geology and Geotechniques, Mcgraw Hill.
- 4). Narayanaswami, B.S. Engineering Geology, Dhanpat Rai & C.Delhi.
- 5). Venkat Reddy, D. Engineering Geology for Civil Engineers, Oxford & IBM Publishers, Delhi.
- 6). PK. Mukerjee-A Text Book of Geology.

SKILL BASED SUBJECT

PAPER - 3

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.

SEMESTER VI

PAPER - 8

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 petrology, Mc Graw Hill Book Co.,
2. Philipotts,A.(1992) Igneous and Metamorphic petrology, Prentice Hall. 3. Bose,M.K.1997, Igneous petrology, World press.

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

PAPER - 9

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 sedimentary 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 roundness, 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 Argaceous, 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 paragenesis - 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 Sedimentology, E.J. John Wiley and Sons, New York
2. Allen J.R.L., 1985., Principles of physical sedimentation, George Allen & Unwin.
3. 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.
5. F.J.Pettijohn, 1975, Sedimentary rocks, Harper & Bros. 3 Ed.
6. Richard C. Shelley, 1992, Applied Sedimentology, Academic press, New york, 8. Sengupta.S. 1997, Introduction to sedimentologyh Oxford-IBH.
7. 9. Bhattacharya, A and Chakraborty, C. 2000, Analysis of sedimentary successions, Oxford-IBH.
9. F.H.Hatch, R.H.Rastall, 1941, .Petrology of Sedimentary rocks Thomas Murby & Co., 11. W.H.Twenhofel and S.A. Taylor, 1941, Methods of Study of sediments, Mc Graw Hill Book Co.,
11. Collison, J.D., & Thompson, D.B, 1989, .Sedimentary structures, 2 nd Ed. Unwin Hyman, London.
13. M.E. Tucker, & V.P. Wright, 1990 Carbonate sedimentology, Macwell Scientific Publication, London,
15. F.J.Turner & J.Verhoogen, 1960. Igneous and Metamorphic petrology, Mc Graw Hill Book Co.,
16. Turner, F.J. 1980, Metamorphic petrology, Mc Graw Hill,
17. Yardley, B.N.W. 1989, An introduction to Metamorphic petrology. Longman, New York.
18. Butcher, K. and Frey, M. (1994) Petrogenesis of metamorphic rocks, Springer Verlag.
19. Kretz, R. 1994 Metamorphic crystallization, John Wiley.
20. G.W. Tyrell, 1989, Principles of petrology, Methuen and Co., (Students ed.)
17. 20. Bhaskar Rao, 1986, 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 Petrology rocks, CBS Publishers & Distributors, New Delhi.
22. W.W. Moorhouse, 1969., The study of rocks in thin sections, Harper and sons,

PAPER - 10

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 : OREGENESIS

Process of mineral formation - primary and secondary process: brief outline of magmatic, sublimite, 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-II : INTRODUCTION TO MINERAL WEALTH

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

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

Study of the following economic minerals of India in Mineral fertilizers: Geology, Source, Uses, Production and distribution of important Economic minerals. Origin distribution and occurrence of Coal, Petroleum and Natural gas. Mineral wealth of Tamilnadu and India, Lignite deposits of Neyveli.

UNIT-V : GEMOLOGY:

Nature of gemstones, Physical properties, application in Gemology, Optical Properties: importance in gemology. Internal feature of gemstones: inclusions, colour zoning. Synthesis of gemstones: Manufacture and identification of synthetic diamond, Units of Measurement: Artificial alteration of gemstones: Descriptions of the principal types of cuts.

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,
4. Indias S. Krishnaswamy , 1972, Mineral Resources, , Oxford and IBH Publishing Co.,
5. J. Coggin Brown & A.K. Dey, 1955, India's Mineral Wealth, Oxford University Press,
6. W. Lindgren, 1933, Mineral deposits, Mc Graw Hill Book Co.,
7. N.K.N. Aiyengar, 1964, Minerals of Madras, Dept. of Industries and Commerce, Madras.

CORE PRACTICAL - 3
CRYSTALLOGRAPHY AND MINERALOGY

CRYSTALLOGRAPHY:

The identification of crystals of different systems, class, forms & symmetry elements by using crystal models.

Crystal Projection

MINERALOGY:

Megascope identification of important rock forming minerals.

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.

CORE PRACTICAL - 4

PETROLOGY AND ECONOMIC GEOLOGY

PETROLOGY:

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.

ECONOMIC GEOLOGY:

Megascopic study and description of important ores and other economic minerals-Oxides, Sulphides, Sulphates, 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 - chalcopyrite, pyrite, sphalerite, galena, bornite, azurite, malachite.

Pegmatites and associated ore minerals - micas, cassiterite, apatite, etc. Sedimentary ore deposits: manganese, hematite, phosphates. Placer minerals - monazite, ilmenite, rutile, magnetite, garnet, zircon, etc.

Decorative stones - granites, charnockites, leptynite, dolerite, calc granulite, Khondalite, syenite and slate.

ELECTIVE

PAPER - 2

GEOGRAPHIC INFORMATION SYSTEM

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.

ELECTIVE

PAPER - 4

ENVIRONMENTAL GEOLOGY AND MARINE GEOLOGY

Environmental Geology:

UNIT-I

Definition of ecology and environmental geology. Different Ecosystems. Classification of Natural resources. A short account of renewable and non renewable resources. Environmental problems due to surface geological processes, causes, hazards and remedial measures relating to landslides, floods and soil erosion. Impact of wind on environment and Global warming.

UNIT-II

Influence of deep seated geological processes – Earthquake hazards, Earth quake prediction control and warning; Reservoir induced seismicity – hazards of volcanism; Techniques of volcanic prediction and human adjustments to volcanic environments. Benefits of volcanism.

UNIT-III

Man as an agent of environmental modification. Environmental degradation due to mining and mineral processing – effects of urbanization on surface water, causes for groundwater pollution. Degradation of coastal environment and measures for coastal protection. Population explosion and their pressure on geological environments.

Marine Geology:

UNIT-IV

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

UNIT-V

Physical and chemical properties of Ocean water. General oceanic circulation of water waves and currents – Factors affecting surface flow of currents – Coriolis effect Ekman's spiral. Tides and their types. Natural mineral resources of the ocean, law of the sea and its implications.

Books for study and reference

1. Kuenen, Ph.H., 1950, Marine Geology, Wiley.
2. Shepard, F.P., 1973, Submarine Geology, Harper and Row.
3. Paul R Pinet, 1999, Oceanography, West Publishing Company, USA.
4. Valdiya, K.S (1987), Environmental Geology – Indian Context. Tata McGraw-Hill., New Delhi.
5. Kellar, E.A. 1979, Environmental Geology, Charles. Merrill Publishing Co.ohio.
6. Lundgren, I. 1986, Environmental Geology, Prentice Hall.

SKILL BASED SUBJECT

PAPER - 4

MINERAL EXPLORATION

UNIT-I

Geological exploration: marginal information of toposheets and study of field equipment. Pitting and trenching the ore bodies. Drilling – types and uses; sampling techniques Types and Principles. Ore reserve estimation.

UNIT-II

Geophysical Exploration: a concise account of limitations and applications of various geophysical exploration methods; the principles, types, origin, instruments, field procedure and interpretations of electrical methods with particular reference to resistivity methods. A brief account on electromagnetic techniques.

UNIT-III

Geodesy of the earth. Newton's law and its application. The earth's gravitational field, the gravity measuring instruments, Density of rocks, Gravity survey at land and sea. Interpretation of gravity data depth problems – Elastic properties of the earth materials, Types of seismic waves, their propagation and characteristics, geophones, principle of refraction.

UNIT-IV

Basic concepts and principles of magnetic prospecting. Magnetism of the earth and palaeomagnetism, Magnetic Susceptibility of rocks. Instruments employed in magnetic prospecting, Principles of radioactive prospecting. Radioactive decay, radioactivity of rocks and minerals, instruments, field procedure and interpretation employed in radioactive survey.

UNIT-V

Geochemical exploration: Origin and abundance of geochemical elements in the earth's crust. The electronic structure of atoms and the Periodic table, chemical bonds, geochemical classification of elements, geochemical exploration for gold, copper and base metals. Application of geochemistry in Mineral exploration studies.

Book for study and reference

1. McKinstry H.E. (1960) – Mining Geology; Asia Publishing House
2. Mathur S.M. (2001) – Guide to Field Geology; Prentice Hall of India.
3. Ramachandra Rao M.B. (1975) – Outlines of Geophysical Prospecting – A manual for Geologist; University of Mysore.
4. Dobrin M.B. (1981) – introduction to Geophysical prospecting. McGraw – Hill
5. Mason.B (1966) - Principles of geochemistry – Willey Toppan.