A.D.M. COLLEGE FOR WOMEN

(AUTONOMOUS)

Nationally Accredited with "A" Grade by NAAC - 3rd Cycle
(Affiliated to Bharathidasan University, Thiruchirappalli)
No.1, College Road, Velippalayam,
Nagapattinam – 611 001, Tamil Nadu, India

DEPARTMENT OF GEOLOGY

(For the candidates admitted from the academic year 2021-2022)

B.Sc., GEOLOGY

SYLLABUS

2021-2024

A.D.M COLLEGE FOR WOMEN (AUTONOMOUS),
Nagapattinam

UG Programme - B. Sc Geology

(For the candidates admitted from 2021 – 2022 onwards)

Bloom's Taxonomy Based Assessment Pattern

Knowledge Level

K1 – Recalling	**K2** – Understanding	**K3** – Applying	**K4** – Analyzing	**K5** – Evaluating	**K6** – Creating

1. Part I, II and III

Theory (External + Internal = 75 + 25 = 100 marks)

External/Internal					
Knowledge Level	**Section**	**Marks**	**Hrs.**	**Total**	**Passing Mark**
K1-K3	A (Answer all)	10 × 2 = 20	3	75	30
K3-K6	B (Either or pattern)	5 × 5 = 25			
K3-K6	C (Answer 3 out of 5)	3 × 10 = 30			

DEPARTMENT OF GEOLOGY
(For the candidates admitted from the academic year 2020-2021)
B.Sc., GEOLOGY

Programme Educational Objectives (PEO):

PEO 1:	To study about surface geologic process and their impact on development of landforms, and ability to identify and interpret landform development.
PEO 2:	Students will use maps (topographic and geologic) to estimate distances, visualise landforms, and locate/identify geographic and geologic features.
PEO 3:	Students will identify common minerals in hand samples and in field exposures of rock using visual clues and simple tests.
PEO 4:	Students will identify common minerals in hand samples and in field exposures using observations of mineral composition and textures.
PEO 5:	To understand public issues in the geological sciences and be ready and able to contribute to their resolution.

Programme Outcomes (POs):

On completion of the course the learner will be able

PO 1:	Gain a better understanding of the Plants, Moons and other objects of our solar system in addition to their distribution and dynamical relationship.
PO 2:	Understand elastic and viscous strain in role behaviour, the effects of temperature, pressure and strain rate on rock strength and the mechanism of rock deformation.
PO 3:	Recognize and quantify the physical and optical properties of minerals Student would understand the Indian Stratigraphy and its age related problems.
PO 4:	Demonstrate the difference between minerals and ore minerals. Explain the formation of placers and other minerals. Explain the origin of igneous rocks and structures.
PO 5:	Students understand the field basic equipment handling and requirements. Understand the compass its uses rock and mineral direction. Understand the student using base map latitude and longitude direction. Gains a better understand the field writing materials, field sketches and drawings.

Programme Specific Outcomes (PSO):

On completion of the course the learner will be able

PSO 1:	Demonstrate fundamental knowledge of: the physical and chemical properties of the lithosphere and hydrosphere (minerals, rocks, soils and water).
PSO 2:	Geological time and Earth history; and crustal materials and dynamics in the context of plate tectonics theory
PSO 3:	Demonstrate skills in: mineral and rock soil identification; interpretation of topographic and geologic maps; and interpreting and evaluating geological data, hypothesis and ideas.
PSO 4:	Gain an understanding of the social relevance of earth systems.
PSO 5:	Effectively communicate this knowledge and these skills using written and/or oral methods.

DEPARTMETN OF GEOLOGY
COURSE STRUCTURE OF THE UG PROGRAMME- B. Sc GEOLOGY

Part	Title of the part	No. of Courses	Hours	Credit
I	Language Course	4	24	12
II	English Language Course	4	24	12
III	Core Course	13	72	65
	Allied Course	6	28	18
	Major Based Elective	3	15	15
IV	Skill Based Elective	3	6	6
	Non Major Elective	2	4	4
V	Extension Activities	0	0	1
	Value Education	1	2	2
	Environmental Studies	1	2	2
	Soft Skill Development	1	2	2
	Gender Studies	1	1	1
	Total	**39**	**180**	**140**

Passing Minimum

A candidate shall be declared to have passed in each course if she secures not less than 40% marks out of 75 marks (i.e., 30 marks) in the End Semester Examination (SE) and 40% out of 25 marks (i.e., 10 marks) in the Continuous Internal Assessment. (CIA).

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM
DEPARTMENT OF GEOLOGY
B.Sc., GEOLOGY

Course Structure under CBCS
(For the candidates admitted from the academic year 2021-2022 onwards)

SEM.	PART	COURSE CODE	COURSE	INS. HRS	CREDIT	EXAM HOURS	MARKS		TOTAL MARKS
							CIA	SE	
I	I	Language Course I (LC)	Tamil-I	6	3	3	25	75	100
	II	Language English Course I (ELC)	English-I	6	3	3	25	75	100
	III	Core Course I (CC)	The Dynamic Earth	6	6	3	25	75	100
		Core Practical I (CP)	Structural Geology and Surveying	3	-	-	-	-	-
		First Allied Course I (AC)	Mathematics I	4	3	3	25	75	100
		First Allied Course I (AC)	Chemistry I	3	-	-	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
			Total	**30**	**17**	**-**	**-**	**-**	**500**
II	I	Language Course II (LC)	Tamil-II	6	3	3	25	75	100
	II	Language English Course II (ELC)	English-II	6	3	3	25	75	100
	III	Core Course II (CC)	Structural Geology	6	6	3	25	75	100
		Core Practical I (CP)	Structural Geology and Surveying	3	3	3	40	60	100
		First Allied Course II (AC)	Mathematics II	4	3	3	25	75	100
		Second Allied Course II (AC)	Chemistry II	3	3	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
			Total	**30**	**23**	**-**	**-**	**-**	**500**

SEM	PART	COURSE	TITLE	INST HOURS/ WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL MARKS
							CIA	SE	
III	I	Language Course III (LC)	Tamil-III	6	3	3	25	75	100
	II	Language English Course III (ELC)	English-III	6	3	3	25	75	100
	III	Core Course III (CC)	Physical Geology	5	5	3	25	75	100
		Core Practical II (CP)	Paleontology and Crystallography	4	-	-	-	-	-
		Second Allied Course I (AC)	Physics I – Lab	5	3	3	25	75	100
		Second Allied Course II (AC)	Physics II	2	-	-	-	-	-
	IV	Non Major Elective I (NME)	Scope of Geology	2	2	3	25	75	100
			Total	**30**	**16**	**-**	**-**	**-**	**500**
IV	I	Language Course IV (LC)	Tamil-IV	6	3	3	25	75	100
	II	Language English Course IV (ELC)	English-IV	6	3	3	25	75	100
	III	Core Course IV (CC)	Paleontology and Crystallography	5	5	3	25	75	100
		Core Practical II (CP)	Paleontology and Crystallography	2	4	3	40	60	100
		Second Allied Course I (AC)	Physics II (Lab)	3	3	3	25	75	100
		Second Allied Course II (AC)	Physics III	4	3	3	25	75	100
	IV	Skill Based Elective I (SBE)	Disaster Management	2	2	3	25	75	100
	V	Non Major Elective II (NME)	Geological of TamilNadu	2	2	3	25	75	100
			Total	**30**	**25**	**-**	**-**	**-**	**800**

SEM	PART	COURSE	TITLE	INST HOURS/ WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL MARKS
							CIA	SE	
V	III	Core Course V (CC)	Stratigraphy	5	5	3	25	75	100
		Core Course VI (CC)	Mineralogy	5	5	3	25	75	100
		Core Practical III (CP)	Mineralogy and Applied Geology	4	3	3	40	60	100
		Major Based Elective I (MBE)	Marine Geology	5	5	3	25	75	100
		Major Based Elective II (MBE)	Aerial Photography, Cartography and GIS	5	5	3	25	75	100
	IV	Skill Based Elective II (SBE)	Basic Hydrology	2	2	3	25	75	100
		Skill Based Elective III (SBE)	Natural Hazards Remote sensing and GIS	2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development	2	2	3	25	75	100
			Total	**30**	**29**	**-**	**-**	**-**	**800**
VI	III	Core Course VII (CC)	Igneous Petrology	6	6	3	25	75	100
		Core Course VIII (CC)	Sedimentary Petrology and Metamorphic Petrology	6	6	3	25	75	100
		Core Course IX (CC)	Economic Geology	6	6	3	25	75	100
		Core Practical IV (CP)	Petrology and Economic Geology	6	5	3	40	60	100
		Major Based Elective III (MBE)	Exploration Geophysics	5	5	3	25	75	100
	V	Extension Activities (EA)	Extension Activities	-	1	-	-	-	-
		Gender Studies (GS)	Gender Studies	1	1	3	25	75	100
			Total	**30**	**30**	**-**	**-**	**-**	**600**
			Grand Total	**180**	**140**				**3900**

Allied I	Allied II
Mathematics or Chemistry	**Physics**

Semester-I / Core Course-I(CC)	The Dynamic Earth	Course Code: GUA
Instruction Hours : 6	Credits: 6	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• Introduction of the geological process that are dynamically involved in the formation of the planet Earth. • To study the evolution of solar system and age of the Earth. • Describe the Earth's interior, including the structure and composition. • Clearly describe plate tectonics in general term. • To learn about the endogenic process like earthquake, volcanoes and orogenic activity.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**DEFINITION OF GEOLOGY** Definition of Geology – Branches of Geology – Applied Geology – Geology in the service of man. The Solar system:– The Planets – Meteorites – Asteroids – Satellites – Comets; Evolution of the Solar system – Nebular hypothesis – Planetesimal hypothesis – Tidal hypothesis – Von Weiszacker's hypothesis and Dust Cloud hypothesis. The age of the earth – sedimentation method - salinity method – Kelvin's rate of cooling method – Radiometric methods: Uranium – lead, Thorium – Lead and Potassium – Argon methods – A note on C14 methods.	**(18 Hrs)**
UNIT II	**EARTHQUAKES** Definition – causes and effects – Focus and Epicenter – Magnitude and Intensity – Properties and propagation of seismic waves – Seismograph and Seismogram – Distribution of Earthquakes – Prediction of Earthquakes – Tsunami – Earthquakes in India. Detailed study of the structure and composition of Earth's interior.	**(18 Hrs)**
UNIT III	**VOLCANOES** Definition – types – phases – solid, liquids and gaseous products, distribution – topographic forms. Causes of volcanism – effects of volcanic activity – prediction of volcanoes. Mass movements – definition – classification – slow movements: soil creep, rock creep and soliflucation. Rapid movements: earth flows, rock falls and landslides. Causes and remedial measures	**(18 Hrs)**
UNIT IV	**OCEANS** Distribution of continents and oceans – Characters of continents and Oceans – Continental margin – Ocean basin – Continental drift: Wegner and Taylor hypothesis – Sea floor spreading – Concept of plate tectonics – Different kinds of plate margins – Evidences in favour and against the concepts of Continental Drift and Plate Tectonics – Mid Oceanic Ridges – Submarine trenches and Transform faults.	**(18 Hrs)**

UNIT V	**MOUNTAINS** Classification – life cycle of mountains – origin of mountains – geosynclines – Stille's, Kay's Strahler's and Schuchert's classification of geosynclines – characters and distribution of geosynclines – types of pleateaus and plains. Isostasy Prat's and Airy's hypothesis – causes, effects and evidences of sea level changes.	**(18 Hrs)**
UNIT VI	The Solar system :– The Planets – Meteorites – Asteroids – Satellites – Comets;Evolution of the Solar system – Nebular hypothesis – Planetesimal hypothesis – Tidal hypothesis – Von Weiszacker's hypothesis and Dust Cloud hypothesis. Isostasy Prat's and Airy's hypothesis – causes, effects and evidences of sea level changes.	**(18 Hrs)**

Text Books:

1. Radhakrishanan V., General Geology., V.V.P. Press,1996.
2. Mahapatra, G.B., A text book of Geology, CBS, Delhi, 2015.
3. Arthur Holmes, Principles of Physical Geology, Thomas Nelson & sons, London. 1993.
4. Philip G. Worcester A textbook of geomorphology, D. Van Nostrand Co., London 1948.

Reference Books:

1. W. D. Thornbury, A text book of geomorphology, D. Van Nostrand co., London,2004.
2. A.L. Bloom, General Geology, V.V.P.Press, 1978.
3. L.D. Leet & Judson Physical Geology, Prentice Hall, India, 1958.

Web resources:

1. www.uj.ac.za/library/bindery
2. https:llen.wikisource.org/wiki/portal:geology

Course Outcomes

On completion of the course, students should be able to

CO 1: Gain a better understanding of the Planets, Moons and other objects of our solar system in addition to their distribution and dynamical relationships.

CO 2: Understanding the geological origins of especially important natural hazards including Earthquakes, Tsunami, Volcanic eruptions and Landslides.

CO 3: Understand platetectonics and its central role as the unifying theory of geology.

CO 4: Articulate the relationship between Volcanoes, Earthquakes, Mountain belts and Tectonic plate boundaries.

CO 5: Understand the nature of the ocean floor.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	M	M	S	S	S	M	S	M
CO 2	S	S	M	M	S	M	S	M	S	M
CO 3	M	S	M	M	S	M	S	M	S	M
CO 4	S	S	M	M	S	M	S	M	S	M
CO 5	S	M	M	M	S	S	S	M	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-I & II/ Core Practical-I	Structural Geology and Surveying – Practical	Course Code: GUBY
Instruction Hours: 6	Credits: 3	Exam Hours: 3
Internal Marks: 40	External Marks: 60	Total Marks: 100

Course Objectives	• To know about the Exercises to predict the trends of the outcrop of horizontal, vertical and inclined beds with respect to topography • Reading of solid fold and fault, maps construction and problems relating to true dip and apparent dip. • To read the marginal in formations of toposheets. • To become familiar with geological signs and symbols. • To learn the practical aspects of survey instruments.	
UNIT	**CONTENT**	**HOURS**
	STRUCTURAL GEOLOGY Contour maps and their interpretation. Exercises to predict trends of the outcrop of Horizontal, vertical anticline beds with respect to topography – reading of solid conformable maps – deciphering dip and strike of outcrops – construction of map with three points over a bedding plane are given construction of vertical sections-order of super position – vertical thickness of formations.	**(18 Hrs)**
	Reading of solid fold and fault maps construction of vertical sections – Determination of throw of vertical faults. Reading of unconformable solid maps – construction of sections. Reading of solid maps of areas when more than one structure is involved – determination of ages of structures and intrusions – narrate geological history – problems relating to true dip and apparent dip. Determination of vertical and true thickness by calculations.	**(18 Hrs)**
	Cartographic appreciation of Survey of India (SOI) Topographic sheets: Description of features in SOI's toposheet: Extra marginal, marginal, intramarginal information, major conventional signs and symbols, physical and socio-cultural features.	**(18 Hrs)**
	SURVEYING Chain Survey – prismatic compass survey – plane table survey – leveling Clinometers Compass and Brunton Compass:- to find out dip and strike of the beds . GPS:- Fundamentals and applications.	**(18 Hrs)**

Course Outcomes

On completion of the course students should be able to

CO 1: Read geologic maps and solve simple map problems using strike lines and cross sections for areas showing dipping strata, unconformities, faults and folds.

CO 2: Establish the basic structure, and the geological history, of a region from its geological maps.

CO 3: Survey of topographic features.

CO 4: Interpret the geologic structure from a geologic maps.

CO 5: Measure the attitude of beds in the field.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	M	S	S	M	S	S	S	M
CO 2	M	S	M	S	S	M	S	S	S	M
CO 3	S	S	S	S	S	M	S	S	S	M
CO 4	S	S	S	S	S	M	S	S	S	M
CO 5	S	S	S	S	S	M	S	M	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-II/ Core Course-II	Structural Geology	Course Code: GUC
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• Understandings of the structure accommodate contractional and extensional deformation of the Earth's lithosphere. • Describe the types of geological structures, how its form, how we can identify and describe them. • To study the structure of igneous and sedimentary rocks. • To recognize various geological structures in field. • To know the preparation of geologic reports.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Scope and aim of structural geology – Methods of representing physiographic features – contours – Topographic and Geologic maps, their preparation and uses. Physical properties of rocks: Deformation – brittleness, plastic and elastic properties. Beds and their attitudes – Dip and Strike – trends of outcrop – Rule of 'V' of outcrops – Relation between true and apparent dips. Width of outcrops, True Thickness, vertical thickness and their mutual relations.	**(18 Hrs)**
UNIT II	Primary and secondary structures – primary structures of extrusive and intrusive igneous rocks– primary structures of sedimentary rocks. Plutons – concordant and discordant plutons – dyke, sill, phacolith, lopolith, batholiths, ring dykes and cone sheets – brief study of salt domes.	**(18 Hrs)**
UNIT III	Folds – geometry and elements of folded surface – classification – descriptive study of different types of folds – recognition – of folds in the field and on map. Unconformities – definition – types – significance – recognition in the field on map – over lap and off lap; Inlier and Outlier.	**(18 Hrs)**
UNIT IV	Faults – definition – terminology – genetic and geometric classification and description – recognition of faults in the field and on the map – distinction between faults and unconformities – a short account of rift valleys. Joints – definition – geometric and genetic – classification – descriptive study – applications of joints.	**(18 Hrs)**

UNIT V	Foliation – Primary and secondary foliations; Cleavage and Schistosity – Types and Origin of Rock Cleavages. Lineation – Kinds and Origin of lineation; Mechanism and Uses of Clinometer and Brunton compass. Preparation of geological reports.	**(18 Hrs)**
UNIT VI	Width of outcrops, True Thickness, vertical thickness and their mutual relations. Joints – definition – geometric and genetic – classification – descriptive study – applications of joints. Mechanism and Uses of Clinometer and Brunton compass. Preparation of geological reports.	**(18 Hrs)**

Text Books:

1. M.P. Billings, Structural Geology: Prentice Hall, Englewood Clifts, U.S.A,2017.
2. C.M. Novin, Principles of structural Geology John Willey, New York,1953.
3. De Sitter, Structural Geology, McGraw Hill, New York, 1956.
4. Gokhale, N.W., Theory of Structural Geology. CBS Publishers, 2013.

Reference books:

1. E.W. Spencer, An Introduction to structural Geology: Mc Graw, Hill, New York, 1977.
2. Park, P.G., Fundamentals of structural Geology, John Willey & sons, Canada, 1994.

Web resources:

1. http://www.uh.edul/jbutler/physical/physical .html.
2. www.geologyin.com.
3. www.geology.com.

Course Outcomes

On completion of the course students should be able to

CO 1: Understand the concepts of stress and force, normal and shear stresses and hydrostatic stresses.

CO 2: Understand elastic and viscous strain in role behavior, the effects of temperature, pressure and strain rate on rock strength and the mechanism of rock deformation.

CO 3: Know the classification of fold, joints and fault systems, the terminology used to describe them.

CO 4: Know the types of foliation and lineation, their origin, and their relationship to folding.

CO 5: Determining the same of fault movement from structures associated with faults.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	M	S	S	M	S	S	S	M
CO 2	M	S	M	S	S	M	S	S	S	M
CO 3	S	S	S	S	S	M	S	S	S	M
CO 4	S	S	S	S	S	M	S	S	S	M
CO 5	S	S	S	S	S	M	S	M	S	M

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M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-III/ Core Course-III	PHYSICAL GEOLOGY	Course Code: BGD
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• Understanding the physical and chemical properties of the lithosphere and atmosphere. • To compare and contrast weathering among different rock types and different environments. • To explain the various parts of hydrologic cycle including the interaction of surface and groundwater with the solid earth. • To describe and interpret surficial deposits and landforms. • To understand the basic fundamentals of tsunami.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Weathering of Rocks – Environment of weathering – weathering processes, chemical and mechanical weathering – Rates of weathering – kinds and products of weathering, soils – weather & climate – Role of weathering in Geologic cycle, Economic importance of weathering. Atmosphere – Its composition and zones. Movements of atmosphere – wind – Geological actions of wind- sand dunes and their types – loses – arid cycle of erosion – characteristics of deserts.	**(15 Hrs)**
UNIT II	Running water – source and surface flow – erosion, transportation and deposition – land reforms resulting from erosion and deposition – valley development – drainage patterns – fluvial cycle (youth maturity and old age) – interruptions to the normal cycle – stream rejuvenation – river capture.	**(15 Hrs)**
UNIT III	Underground water – sources – water table – zone of saturation – springs and wells – artesian wells – geysers – spring deposits – aquifer – geological work of ground water – solution – Karst topography – development of Karst features – characteristics of Karst regions – origin of Limestone. Caverns – artesian belts of Tamilnadu.	**(15 Hrs)**
UNIT IV	Glaciers – origin and types of glaciers – movement of glaciers – transportation and deposition – glacio fluvial deposits – landforms produced by glaciers – short account of Ice ages. Lakes – classification – types of lakes – lake deposits.	**(15 Hrs)**
UNIT V	Seas and Oceans – waves tides and currents – sea as a geological agent – classification of shore line – shore line types –	**(15 Hrs)**

	description of continental margin – continental – shelf – continental slope – ocean basin – submarine canyons – sea mount, guyots mid – oceanic ridges – ocean deposits – coral reef: their types and origin; tsunamis – distribution and origin.	
UNIT VI	Movements of atmosphere – wind – Geological actions of wind- sand dunes and their types – loses – arid cycle of erosion – characteristics of deserts – Karst topography – development of Karst features – characteristics of Karst regions – origin of Limestone. Caverns – artesian belts of Tamilnadu.	**(15 Hrs)**

Text books:

1. Philip G.Worcester : A text book of Geomorphology – D. Nostrandcomp Inc. New York.
2. Thornbury, W.D., (2004) Principles of Geomorphology. II edition. Wiley Eastern Ltd. New Delhi.

Reference books

1. D.Leet & Shelton Judson: Physical Geology – prentice Hall, Internation Inc. Englewood, Cliff, U.S.A.
2. Arthur Holms : Principles physical Geology Thomos Nelson & sons, London
3. William J, Miller: An introduction to physical Geology, D. Van Nostrand Company, Inc New York
4. Radhakrishnan.V, 1996: General Geology, VVP, Tuticorin.

Web resources:

1. http://www.uh.edul/jbutler/physical/physical .html.
2. www.geologyin.com.
3. www.geology.com.

Course Outcomes:

On completion of the course students should be able to

CO 1: Understand the concepts of weathering.

CO 2: Understand the process and features formed due to running water

CO 3: Know the sources of groundwater and its features.

CO 4: Know the weathering process of glaciers and ice age.

CO 5: Determining the ocean features and tsunami.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	M	S	S	M	S	S	S	M
CO 2	M	S	M	S	S	M	S	S	S	M
CO 3	S	S	S	S	S	M	S	S	S	M
CO 4	S	S	S	S	S	M	S	S	S	M
CO 5	S	S	S	S	S	M	S	M	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-III & IV/ Core Practical-II	PALEONTOLOGY AND CRYSTALLOGRAPHY - PRACTICAL	Course Code: GUEY
Instruction Hours: 6	Credits: 4	Exam Hours: 3
Internal Marks: 40	External Marks: 60	Total Marks: 100

Cognitive Level	K1 -Recalling K2 -Understanding K3 -Applying K4 - Analyzing K5 - Evaluating K6 - Creating	
Course Objectives	• To identify the different types of fossils. • To know the evolutionary period of fossils. • To identify some of the morphological characteristics of fossils. • To understand the crystal structure. • To learn the twinning of crystals.	
UNIT	**CONTENT**	**HOURS**
I	**PALAEONTOLOGY** Megascopic identification and description of the following fossils:- Corals: Calceola, Zaphrentis, Favosites, Halysites,; Brachiopoda: Spirifer, Productus, Terebratula, Rhynconella, Atrypa, Athyris, Orthis, Echinodermata: Pentrimites, Cidaris, Hemicidaris, Micraster, Holaster, Hemiaster, Stygmatophygus, Mollusca: Pelecypoda: - Arca, Cardium, Meretrix, Cardita, Pecten, Trigonia, Megaladon, Pholodomya, Gryphea, Exogyra, Ostrea, Inoceramus, Alectryonia. Gasteropoda:- Natica,Turbo, Trochus, Turritella, Cerethium, Conus, Voluta, Murex, Fusus, Physa, Bellerophon. Cephalopoda:- Nautilus, Goniatites, Ceratites, Acanthoceras, Scholenbachia, Perisphinctes, Hamites, Scaphites, Baculites, Turrilites and Belemnites, Arthropoda: Trilobita:- Paradoxides, Calymene, Phacops. Trinucleus, Graptolites: - Phyllograptus, Tetragraptus, Didymograptus, Diplograptus, Monograptus, Plant fossils:- Glossopteris, Gangamopteris, Ptillophyllum, Lepidodendron, Sigillaria and Calamites	**(18 Hrs)**
II	**MICRO FOSSILS** Lagena, Nodosaria, Textularia, Operculina, Elphidium, Ammonia.	**(18 Hrs)**
III	**DIAGRAMS** Paradoxides, Pentremites, Trigonia, Arca, Meretrix, Murex, Turritella, Nautilus, Spirifer.	**(18 Hrs)**

IV	**CRYSTAL MODELS** Identification and description of the following crystal models: Galena, Garnet, Fluorite, Pyrite, Tetrahedrite, Boracite, Sphalerite, Cuprite, Zircon, Cassiterite, Rutile, Octahedrite, Apophyllite, Vesuvianite, Scheelite, Meonite, Wulfenite, Chalcopyrite, Beryl, Zincite, Apatite, Calcite, Haematite, Dolomite, Corundum, Tourmaline, Phenacite, Dioptase, Quartz, Olivine, Topaz, Barite, Andalusite, Cordierite, Sulphur, Staurolite, Hypersthene, Calamine, Struvite, Epsomite, Gypsum, Orthoclase, Augite, Hornblende, Epidote, Sphene, Axinite, Albite, Kyanite and Rhodonite.	**(18 Hrs)**
V	**SIMPLE TWIN MODELS** Galena, Fluorite, Pyrite, Rutile, Calcite, Quartz, Staurolite, Gypsum, Augite, Orthoclase, Albite.	**(18 Hrs)**

Course Outcome:

On completion of the course students should be able to

CO 1: Find, collect, prepares, study and exhibit fossils.

CO 2: Collect and analyze geologic materials in field.

CO 3: Determine the environment of the earth during the geologic past.

CO 4: Interpret the miller indices of crystals.

CO 5: Recognize crystallographic panes and directions.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	**PO**					**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	M	M	M	M	S	S	S	S	M	M
CO 3	M	M	S	M	S	S	S	S	M	M
CO 4	S	S	S	S	S	S	S	S	S	M
CO 5	S	S	S	M	S	S	S	S	S	M

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-III /NME-I	Scope of Geology	Non Major Elective: NME I
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the various processes of physical agents such as wind, water, glaciers and sea waves. • To study of the crystallography is not much important to civil engineering, but to recognize the minerals the study of crystallography is necessary. • It deals with the study of structures found in rocks. It is also known as tectonic geology or simply tectonics. • The study of fossils and the ancient remains of plants and animals are referred to as fossils of stratified rocks and their correlation. • To know and understand about the distribution and abundance and threat to water resources, relationship of water to engineering properties and rocks and geological features.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Wind – brief study of land forms resulting from erosion and deposition. Running water erosion, transportation and deposition. Glaciers – origin and types of glaciers. Seas and Oceans – waves, tides and currents.	**(5 Hrs)**
UNIT II	Definition of crystal – morphological characters of crystal – faces – forms – edges solid angles – Interfacial angle. Definitions of Mineral – Mineraloid, Ore and Gangue. Brief study of Physical Properties of Minerals.	**(5 Hrs)**
UNIT III	Scope and aim of Structural Geology – Geometry and mechanics of development of folds, fault, foliations and lineations. General classification of the rocks into and a comparative study of the characteristics of Igneous, Sedimentary and Metamorphic rocks.	**(5 Hrs)**
UNIT IV	Definition of Palaeontology – Geological Time Scale. Index fossil. Uses of fossils, discussion on importance of fossil in stratigraphic record.	**(5 Hrs)**

UNIT V	Role of geology in Engineering and properties of rocks. Origin of water: meteoric, juvenile, magmatic and sea waters, Hydrologic cycle – precipitation, runoff, infiltration and evapo transpiration – Hydrographs.	**(5 Hrs)**

Text books:

1. Thornbury, W.D., (2004) Principles of Geomorphology. II edition. Wiley Eastern Ltd. New Delhi.
2. Dana, F.S. (1955) : A text book of mineralogy - Asia Publishing House -Willey.
3. Krishnan M.S. (2003) - Geology of India and Burma, 6th Edition, CBS.
4. Karanth, K.R. (1998), Groundwater Management, S.R. Technico Book house, Ashok Raj path, patna-6.

Reference books:

1. Arthur Holms: Principles physical Geology Thomos Nelson & sons, London.
2. Walhstrom, E.F.1960 - Optical crystallography – John Wiley.
3. Moore, R.C., Laliker , C.G.&Fishcher, A.G.: Invertebrate Fossils , Harper brothers
4. Gregory, J.W. and Barret B.H - General stratigraphy mathuen.

Course Outcomes

On completion of the course students should be able to

CO 1: Understand the process and features formed due to running water and process of glaciers and ice age.

CO 2: Understand the concepts origin of crystal forms and faces.

CO 3: Recognize and quantify the physical and optical properties of minerals.

CO 4: Student would understand the Indian Stratigraphy and its age related problems.

CO 5: Understand the components of hydrologic cycle.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	M	M	M	S	S	S	S	M
CO 2	S	S	M	M	M	S	S	S	M	M
CO 3	S	S	S	S	S	S	S	S	M	M
CO 4	S	S	S	M	S	S	S	S	S	M
CO 5	S	S	S	M	M	S	S	S	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-IV / Course Code – IV	Palaeontology and Crystallography	Course Code: BGF
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• Understanding the age of the earth through the study of fossils. • To compare the evolution of life through geologic times. • To understand the palaeoclimate and palaeoenvironment conditions. • To describe the morphology of crystals. • To understand the basic fundamentals of different types of crystal system.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Definition of Palaeontology – Definition of fossils – nature and modes of preservation of fossils: Body fossils and trace fossils; Body fossils – Petrifaction, permineralisation, carbonisation, recrystallisation, silicification; trace fossils – mould, casts, tracks, trails, borings. Uses of fossils in – stratigraphy – palaeoclimate – palaeogeography – palaeolife – evolution and migration of life forms – economic geology. Life through ages. Phylum Arthropoda:- Class – Trilobita – General morphology – classification – geological history and stratigraphic importance. Subphylum Hemichordata – class Graptozoa: order Graptoloidea – general morphology, classification, geological history and stratigraphic importance.	**(15 Hrs)**
UNIT II	Phylum Coelentrata – class Anthozoa – classification –- tabulate corals – Rugose corals. General morphology geological distribution – stratigraphic importance. Phylum Mollusca: Class Pelecypoda - General characters – dentition, classification and geological history. Class Gasteropoda:- General morphology, shell forms – types of coiling – dextral and sinistral, perforate and imperforate-classification and geological history. Class Cephalopoda:- General morphology, suture line pattern, classification, geological history. Morphology of a Belemnite.	**(15 Hrs)**

UNIT III	Phylum Brachiopoda:- General morphology – brachial skeleton, classification, geological history. Phylum Echinodermata: Class Echinoidea: General morphology – regular and irregular echinoids, classification – geologicial history. Class Crinoidea:- General morphology and geological history. Class Blastoidea: General morphology and geological history. Phylum protozoa – Order: Foraminifera: General morphology – dimorphism – classification and stratigraphic importance. A brief account of the following plant fossils:- Glossopteris, Gangamopteris, Ptilophyllum, Calamites, Lepididendron and Sigillaria.	**(15 Hrs)**
UNIT IV	Definition of crystal – morphological characters of crystal – faces –forms – edges solid angles – Interfacial angle. Contact Goniometer and its uses. Symmetry elements – crystallographic axes – crystal notation – parameter system of Weiss and Miller indices – axial ratio – laws of crystallography – the law of constancy of symmetry, the law of constancy of interfacial angles and the law of rational indices. Study of the symmetry elements and forms of the Normal, pyritohedral, tetrahedral and plagiohedral classes of cubic system. Study of symmetry elements and forms of Normal, Hemimorphic, Sphenoidal and Trapezphedral classes of Tetragonal system.	**(15 Hrs)**
UNIT V	Study of the symmetry elements and forms of Normal, Hemimorphic Trapezohedral, Rhombohedral, Rhombohedral Hemimorphic classes of Hexagonal system. Study of the symmetry elements and forms of the Normal, Hemimorphic and Sphenoidal classes of Orthorhombic system. Study of the symmetry elements and forms of the Normal classes of the Monoclinic and Triclinic systems. Twin crystals – Definitions – simple and repeated (polysynthetic twins), contact and penetration twins: secondary twins.	**(15 Hrs)**
UNIT VI	Phylum Arthropoda:- Class – Trilobita – General morphology – classification – geological history and stratigraphic importance. Study of symmetry elements and forms of Normal, Hemimorphic, Sphenoidal and Trapezphedral classes of Tetragonal system.	**(15 Hrs)**

Text books:

1. Dana, F.S.(1955) : A text book of mineralogy - Asia Publishing House - Willey.
2. Jain, P.C., and Anatharaman, M.S. An Introduction to Palaeontology, Vishal Publications

Reference books:

1. Raup, D.M. and Stanely, M.S : Principles of Palaeontology, CBS Publishers.
2. Moore, R.C., Laliker, C.G.& Fishcher, A.G: Invertebrate Fossils, Harper brothers.
3. Shrock. R.R and Twenhofel, W.H – 1953: Principles of invertebrate Palaeontology, Amold publication.
4. Phillips, W.R. Optical Minerlogy,Griffen, D.T.1986.
5. Walhstrom, E.F.1960 - Optical crystallography – John wiley.

Course outcomes:

On completion of the course students should be able to

CO 1: Demonstrate their understanding of how life has evolved through geologic time.

CO 2: Identify and explain the morphological characters of fossils.

CO 3: Explain the evolutionary trends of fossils.

CO 4: Understand the concepts origin of crystal.

CO 5: Know the forms and faces of crystals.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	M	S	S	S
CO 2	S	S	S	S	S	S	M	S	S	S
CO 3	S	S	S	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	M	S	S	S
CO 5	S	S	S	S	S	S	M	S	S	S

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-IV / SBE - I	Disaster Management	Course Code: SBE - I
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the disaster of factors and significance • To study the earthquakes characteristics and pre casers. • To learn the floods causal phenomena and characters. • Describe the cyclones characteristics, forecasting and warning systems. • To study the causes of land slide and snow avalanche.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**DISASTER** Meaning, Factors and significance, causes and effects of disaster, Disasters: A global view. Disaster profile of India – Regional and seasonal.	**(5 Hrs)**
UNIT II	**EARTHQUAKES** General characteristics, Pre-Casers: Instrumental and non-instrumental vulnerability, impact and effects, Nature of damage, earthquakes prone areas in India.	**(5 Hrs)**
UNIT III	**FLOODS** Causal phenomena and characters of floods, vulnerability, predictability, forecasting and warning, preparedness mitigation with special reference to flood plain zoning adverse effects of flood.	**(5 Hrs)**
UNIT IV	**CYCLONES** Characteristics, forecasting and warning systems, preparedness, such reduction measures, effects, cyclones prone areas in India.	**(5 Hrs)**
UNIT V	**LAND SLIDE AND SNOW AVALANCHES** Characteristics and causes of land slide and snow avalanche. Characteristics and causes, vulnerability, Risk reduction measures, preparedness, effects and impacts.	**(5 Hrs)**

Text Books:

1. Aravind Kumar Anmal, 2006. Disaster Management – Recent Approaches
2. Ghorh. G.K Disaster Managemen. 2006. A.P.H Publishy Corporation.
3. Singh, 2006. Disaster Management. Rawat Publication.

Reference Books:

1. Narayan B., 2006. Disaster Management. A.P.H Publishy Corporation.
2. Nikij Kumar., 2006. Disaster Management. Alfa Publication.

Course Outcomes

On completion of the course students should be able to

CO 1: Understand the disaster regional and seasonal a global view

CO 2: Understand the geological origin of especially important one natural hazards earthquake

CO 3: Know the preparedness mitigation with special reference to flood plain zoning adverse effects.

CO 4: Determine the cyclones characteristics such as reduction measures and effects.

CO 5: Understand the nature of the landslide.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	M	M	S	S	S	S	M
CO 2	S	S	S	M	M	S	S	S	S	M
CO 3	S	S	M	M	M	S	S	S	S	M
CO 4	S	S	S	M	M	S	S	S	S	M
CO 5	S	S	S	M	S	S	S	S	S	M

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Semester-IV / Non Major Elective - II	**Geological of Tamilnadu**	**Non Major Elective: NME - II**
Instruction Hours: 2	**Credits: 2**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the geomorphological and Ghats of Tamilnadu. • To study the structures of shear zones. • Understanding the components of Proterozoic formations. • To estimate Gondwana formations of Tamilnadu. • The study of recent and sub recent formations of marine coastal deposits.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**GEOMORPHOLOGY AND PHYSIOGRAPHY OF TAMILNADU** Geological Time scale of India. General Geological setting of Tamilnadu. Geomorphology: Physiography – Western and Eastern Ghats of Tamil Nadu and their structural aspects.	**(5 Hrs)**
UNIT II	**STRUCTURES, TECTONICS AND SHEAR ZONES OF TAMILNADU** Structure and Tectonics of TamilNadu. Shear zones of Tamilnadu – Palghat – Cauvery, Moyar – Bhavani, Salem-Attur and Gangavalli- Achankovil shear Zones.	**(5 Hrs)**
UNIT III	**ARCHEAN SYSTEMS AND PROTEROZOIC FORMATIONS OF TAMILNADU** Archean systems – Sathiyamangalam Greenstone Belt – Penninsular gneiss, Charnockite, Khondalites. Proterozoic formations – Charnockite-Migmatite and Granite.	**(5 Hrs)**
UNIT IV	**FORMATIONS OF TAMILNADU** Gondwana formations – Sivaganga formations, Sriperamabalur beds, Terani formations, Creataceous of Trichinopoly marine formations.	**(5 Hrs)**

UNIT V	**MINERAL WEALTH OF TAMILNADU** Tertiary formations – Cuddalore formations – Neyveli Lignite formation, Kariaikal formations, Panamparai Sandstone – Recent Sub-recent fluvio-marine coastal deposits – Manavalakuruchi, Thoothukudi. Mineral wealth of Tamilnadu.	**(5 Hrs)**

Text Books:

1. Subramaniam K. S and Selvam T. A., 2001. Geology of Tamilnadu and Pondicherry. Geological society of India, Bangalore 192pp.
2. Krishnan M. S., 1968. Geology of India and Burma, Higginbothams
3. Wadia D.N., 1953. Geology Of India. Macmillian and Co.

Reference Book:

1. Kumar 1985. Fundamentals of Historical Geology and Stratigraphy of India.

Course Outcomes:

On completion of the course students should be able to

CO 1: Understanding the general geological settings of Tamilnadu and their structural aspects.
CO 2: Gain a better understanding of the structures and tectonics of shear zones of TamilNadu.
CO 3: Understanding the Archean systems and Proterozoic formations of charnockite, migmatite and granite.
CO 4: Articulate the relationship between Gondwana and Terani formations
CO 5: Understand the mineral wealth of Tamilnadu.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	**PO**					**PSO**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	S	S	S	S	S	S	S	M
CO 2	M	S	S	S	S	S	S	S	S	M
CO 3	M	S	S	S	S	S	S	S	S	M
CO 4	M	S	S	S	S	S	S	S	S	M
CO 5	M	S	S	S	S	S	S	S	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-V / Course Code V	Stratigraphy	Course Code: BGG
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To learn about the geological time scale, principles of stratigraphic 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. • To study the geological and applications of stratigraphy. • To realize the different geological epoch formation. • To collect stratigraphic data in the field. • To synthesize geological and biological information to interpret local and regional geologic history.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**PRINCIPLES OF STRATIGRAPHY** Law of order of superposition. Law of uniformitarianism and law of faunal succession. Correlation: fossiliferous and unfossiliferous rocks. Standard stratigraphic scale and Indian Geologic Time scale. Imperfections in Geological record. Geological divisions. Stratigraphic classification and Nomenclature. Stratigraphic Units: Lithostratigraphic unit, Biostratigraphic unit, Geochronologic Unit. Homotaxis. Physiographic divisions of India: Peninsular India, Indogangetic alluvial plains, Extra Peninsular India.	**(15 Hrs)**
UNIT II	**PRECAMBRIAN STRATIGRAPHY** Archaeans of Dharwar Province, Archaeans of Eastern Ghat - The Sausar and Sakoli Group, Archaeans of Singhbhum – Iron Ore Group and Gangpur Group. Archaeans of Tamilnadu, Mineral Wealth of Archaeans of India, The Eparchaean Unconformity, Stratigraphy and Mineral Wealth of Cuddapahs, Stratigraphy and Mineral Wealth of Vindhyans, Kurnool group, Life during Precambrian.	**(15 Hrs)**

UNIT III	**PALEOZOIC STRATIGRAPHY** Distribution of Paleozoic rocks in India, Cambrian of Salt Range, Age of Saline Series, Upper Carboniferous and Permian rocks of Salt Range, Paleozoic rocks of Kashmir Valley, Paleozoic rocks of Spiti Valley, Paleozoic rocks of Peninsular India.	**(15 Hrs)**
UNIT IV	**MESOZOIC STRATIGRAPHY** The Depositional Environment – distribution – life – classification and economic importance of Gondwana formations of India. Coastal Gondwana of India, Gondwana formations of Tamilnadu. Triassic of Spiti – The Lilang System, Jurassic of Kutch, Cretaceous of Tiruchirapalli – Pondicherry – Bagh Beds, Deccan traps: distribution, structure, Lameta beds – infratrapean and intertrapean beds, age of the Deccan traps.	**(15 Hrs)**
UNIT V	**CENOZOIC STRATIGRAPHY** Comprehensive account of the geological events took place during Cenozoic era in India, rise of Himalayas, stratigraphy of Siwalik Super Group, fauna and flora of Siwaliks, Tertiary rocks of Assam, Karewa formation, Tertiary rocks of Tamilnadu, Tertiary rocks of Kerala, Pleistocene Glaciation - Mineral wealth of Tertiary rocks of India.	**(15 Hrs)**
UNIT VI	Homotaxis. Physiographic divisions of India: Peninsular India, Indogangetic alluvial plains, Extra Peninsular India – Coastal Gondwana of India, Gondwana formations of Tamilnadu. Triassic of Spiti	**(15 Hrs)**

Text Books:

1. Krishnan M.S. (2003) - Geology of India and Burma, 6th Edition, CBS.
2. Wadia D.N. (1953) – Geology of India, TATA McGraw – Hill.
3. Ravindrakumar K.R. - Stratigraphy of India. Lemon R.Y (1990) - Principles of Stratigraphy, Merrill Publishing Co.

Reference Books:

1. Pascoe, E.H. (1968) - A manual of the Geology India and Burma, Govt of India Publications.
2. Gregory, J.W. and Barret B.H - General stratigraphy mathuen.

Course Outcome

On completion of the course students should be able to

CO 1: It focus specifically on settings and time periods that the students will encounter on our field trips, emphasizing the combined use of sedimentological characteristics and fossil content

CO 2: Student would understand the Indian Stratigraphy and its age related problems.
CO 3: Utilizes both forward reasoning and inverse reasoning to construct one or more hypotheses for the paleogeographic and environmental histories that produced a series of strata.

CO 4: The course then adds larger geological principles to the foundation stratigraphy, effects of sedimentary processes and sedimentation rates on interpretation of evolution in the fossil record.
CO 5: Student would understand world physiographic divisions and rock formation.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	S	S	S	S	S	S	S	S	S	M
CO 3	S	S	S	S	S	S	S	S	S	M
CO 4	S	S	S	S	S	S	S	S	S	M
CO 5	S	S	S	S	S	S	S	S	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-V / Course Code VI	Mineralogy	Course Code: BGH
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• The first unit deals with the introduction to the rock forming minerals and other concepts related to mineralogy. • The second unit deals with the physical, chemical and optical properties of common rock forming minerals. • Recognize that minerals are chemical compounds made up of atoms linked together by a variety of chemical bond types. • Systematic mineralogy of common rock forming minerals.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**DESCRIPTIVE MINERALOGY** Definition of Mineral and Mineraloid – Scope and aim of Mineralogy. Chemical elements and periodic Table – Bonding of atoms – Metallic, Co-valent, Ionic and Van der Walls Bonding in Minerals, Structure and classification of silicates. Isomorphism, Polymorphism and Pseudomorphism in minerals. Physical properties of minerals depending upon cohesion and elasticity, specific gravity, light, heat, electricity, magnetism and the senses.	**(15 Hrs)**
UNIT II	Mineralogy, Structure, Chemistry, Optical and Physical properties, modes of occurrences and industrial uses of the following groups of minerals: Polymorph and varieties of Quartz – Alkali and Plagioclase group of Feldspars – Nepheline and Sodalite group of Feldspathoides and Zeolites.	**(15 Hrs)**
UNIT III	Mineralogy, Structure, Chemistry, Optical and Physical properties, Modes of occurrences and industrial uses of the following groups of minerals: Pyroxenes, Amphiboles, Micas, Olivine and Garnet.	**(15 Hrs)**

UNIT IV	**OPTICAL MINERALOGY** Nature of light – Ordinary and polarized light – Refraction and reflection. Refractive index, Critical angle and Total internal reflection. Double refraction – Plane polarization by Reflection, Brewster's law – Plane polarization by Refraction, Nicol Prism – Plane polarization by absorption, Polaroid. Petrological microscope and its parts – Optical accessories, their construction and uses – Quartz wedge (Determination of order of Interference Colour) – Gypsum plate and Mica plate (Determination of Fast and Slow vibration directions), and Bereck Compensator (Determination of Birefringence)	**(15 Hrs)**
UNIT V	Optical classification of minerals. Optical properties of isotropic and anisotropic minerals observed under parallel and crossed Nicols. Differences between Isotropic and anisotropic minerals. Definition of extinction, Types of extinction, Extinction angles and their determination, and uses – Characters of Uniaxial and biaxial minerals – Optics axis and optic axial angle – Acute and Obtuse Bisectrix – Optic sign of Uniaxial and Biaxial minerals – Uniaxial and Biaxial Indicatrix – Sign of elongation – Optical anomalies.	**(15 Hrs)**
UNIT VI	Double refraction – Plane polarization by Reflection, Brewster's law – Physical properties of minerals depending upon cohesion and elasticity, specific gravity, light, heat, electricity, magnetism and the senses	**(15 Hrs)**

Text Books:

1. Dana, F.S. 1955 – A text book of mineralogy – Asia publishing House, Wiley
2. Read, H.H- 1974 – Rutley's elements of mineralogy – Thomas murby & Co
3. Mason., B and Berry, L.G – Elements of Mineralogy – W.H. Freeman & Co
4. Kerr.P.F: Optical Mineralogy

Reference Books:

1. Deer. W.A., Howoe. R.A and Zuessman, J. -1966. An introduction of the Rockforming minerals. Longmans.
2. Berry , Mason, Dietrich,2000 – Mineralogy, CBS Publication
3. Cornelis Klen and Cornelius S. Hurlbut , 1985 – Manual of Minerology, John wiley & Sons
4. Phillips, W.R. Optical Minerlogy,Griffen, D.T.1986.
5. Winchel, A.n. 1968 Elements of optical mineralogy, part 1 & 2 wiley Eastern

Course Outcomes

On completion of the course students should be able to

CO 1: Student thoroughly understands the various crystal structures and megascopic and optical characters of various minerals.

CO 2: Understand the basic crystal-chemical properties of minerals and how variability in these properties relates to physical and optical characteristics as well as the formation and stability of minerals in igneous, metamorphic, and sedimentary environments.

CO 3: Recognize and quantify the physical and optical properties of minerals.

CO 4: Microscopic thin section study and identity characterize common rock-forming minerals.

CO 5: Extract information about the conditions of formation and subsequent history of a mineral from its properties and its presence in a rock.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	S	S	S	S	S	S	S	S	S	M
CO 3	S	S	S	S	S	S	S	S	S	M
CO 4	S	S	S	S	S	S	S	S	S	M
CO 5	S	S	S	S	S	S	S	S	S	M

S – Strongly Correlated

M – Moderately Correlated

W – Weakly Correlated

N – No Correlation

Semester-V / Core Practical: CP – III	Mineralogy and Applied Geology	Course Code: BGIY
Instruction Hours: 4	Credits: 3	Exam Hours: 3
Internal Marks: 40	External Marks: 60	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To learn the megascopic and Microscopic identification of Quartz, Feldspar, Feldspathoid, Pyroxene, Amphibole groups. • Describe the characteristics physical properties that we use to identify minerals, including crystal shape, color, luster and hardness. • To discuss the cite examples of the important properties and characteristics of the silicate nonsilicate rock forming minerals. • To interpret the hydrogeological data. • To solve the calculation of ore reserves.	
UNIT	**CONTENT**	**HOURS**
	MEGASCOPIC MINERALOGY Megascopic identification and description of the following: Quartz, Rosy quartz, Amethyst, Chalcedony, Agate, Flint, Jasper, Chert, Opal, Orthoclase, Microcline, Albite, Oligoclase, Labradorite, Nepheline, Leucite, Sodalite, Enstatite, Bronzite, Hypersthene, Diopside, Augite, Spodumene, Acmite, Rhodonite, Wolastonite, Anthopillite, Tremolite, Actinolite, Hornblende, Glaucophane, Olivine, Serpentine, Muscovite, Biotite, Vermiculite, Chlorite, Epidote, Garnet, Olivine, Natrolite, Stilbite, Apophyllite, Talc, Steatite, Andalusite, Kyanite, Sillimanite, Staurolite, Cordierite, Apatite, Beryl, Topaz, Calcite, Dolomite, Tourmaline, Zircon, Fluorite.	**(12 Hrs)**
	MICROSCOPIC MINERALOGY Microscopic identification and Description of the following:- Quartz, Orthoclase, Microcline, Albite, Oligoclase, Labradorite, Nepheline, Leucite, Enstatite, Hypersthene, Glaucophane, Biotite, Muscovite, Olivine, Epidote, Garnet, Apatite, Zircon, Sphene,	**(12 Hrs)**

	Tourmaline, Calcite, Andalusite, Kyanite, Sillimanite, Staurolite, and Cordierite.	
	APPLIED GEOLOGY Interpretation of maps – Calculation of ore reserves – Included area method. Simple problems relating to interpretation of hydrogeological data.	**(12 Hrs)**
	BLOW PIPE Identification of the following mineral powders by simple blow pipe tests:- Apatite, Barite, Calcite, Celestite, Cerusite, chalcopyrite, Galena, Gypsum, Chromite, Haematite, Magnesite, Magnetite, Psilomelane, Pyrolusite, Siderite, Sphalerite, Strontianite, Witherite, Stibnite, Ilmenite and Worlframite.	**(12 Hrs)**

Course Outcomes

On completion of the course students should be able to

CO 1: Students can able to describe several common mineral crystal habits.

CO 2: Students will be trained in how to investigate the nature of things through observation and using their senses.
CO 3: Compare samples of various kinds of rock, and identify similarities and differences
CO 4: Describe some common uses of rocks and minerals
CO 5: Student thoroughly understands the various crystal structures and megascopic and optical characters of various minerals.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	M	S	S	S
CO 2	S	S	S	S	S	S	M	S	S	S
CO 3	S	S	S	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	M	S	S	S
CO 5	S	S	S	S	S	S	M	S	S	S

S – Strongly Correlated

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W – Weakly Correlated

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Semester-V / MBE - I	MARINE GEOLOGY	Major Based Elective: MBE – I
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the history of marine geology and sampling techniques. • To understand the waves, tides, currents and bottom of the sea. • To study the ocean currents tsunamis causes, generation and effects. • To study the beach minerals and instruments applications in sea. • It deals in detail about the law of the sea, marine deposits.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**HISTORY OF MARINE GEOLOGY AND SAMPLING TECHNIQUES** History of Marine Geology. Principles and application of Echo sounder, Side scan sonar, Position fixing at Sea. Bottom sediment samplers.	**(15 Hrs)**
UNIT II	**WAVES AND TIDES** Waves: Definition, Parts of waves, Types of waves, Classification of waves and wave interactions with the shore. Tides: Definition, Classification and types.	**(15 Hrs)**
UNIT III	**OCEAN CURRENTS TSUNAMIS** Definition, causes, generation, propagation and effects. Ocean Currents: Definition and causes. Littoral processes.	**(15 Hrs)**
UNIT IV	**OCEAN FLOOR AND COASTLINE CLASSIFICATION** Geomorphology of the ocean floor – Sea floor spreading – Coastline classification – Beach materials.	**(15 Hrs)**
UNIT V	**MARINE DEPOSITS AND COASTAL ZONE REGULATION** Eustatic Sea level changes, Marine deposits, Laws of the sea and Coastal zone regulation.	**(15 Hrs)**

Text Books:

1. Kuenen, Ph.H., Marine Geology. John Wiley and Sons,1950
2. King, C.A.M. – Beaches and coasts, Edward Arnold, London 1959.
3. King, C.A.M. – Introduction to marine Geology and Geomorphology. Edward Arnold, London, 1975.
4. Manimaran G., 2007. Indian Ocean Tsunami and Related events. Renuga publications. Tirunelveli pp. 72.

Reference Books:

1. Radhakrishnan V., 1996. General geology V.V.P Publishers, Tuticorin.
2. Siddhartha K., 2002. Oceanography: A Brief Introduction, Kisalaya publications Pvt. Ltd, pp 347.
3. Shepard, F.P., 1978. Geological Oceanography, Heinmann, London.
4. Freeman W.H and Sanfrancis Co., 1969. The Ocean. A Scentific American book and company.

Course Outcomes

On completion of the course students should be able to

CO 1: Gain a better understanding of the principles and application of echo sounder, side scan sonar relationship.
CO 2: Determining the waves and tides.
CO 3: Know the sources of ocean currents causes and littoral processes
CO 4: Know the weathering process of geomorphology of the ocean floor.
CO 5: Articulate the relationship between marine deposits and coastal zone regulation.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	M	M	S	S	S	M	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	M	S	M	S	S	S	S	S	S	S
CO 4	M	S	S	S	S	S	S	M	S	S
CO 5	M	S	S	M	S	S	S	S	S	S

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Semester-V / Major Based Elective - II	Aerial Photography, Cartography and GPS	Major Based Elective: MBE – II
Instruction Hours: 5	**Credits: 5**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To gain knowledge in application of Geology in engineering practices such as construction of dams, tunnels, and bridges and in Hydrogeology, lineament, drainage pattern, surface water bodies etc. • To study the aerial photography based on camera axis. • To study the parts of simple camera distortions and aberrations • Understanding about the photo mosaics and Analog digital techniques. • To know about the application of remote sensing and photogeology in the interpretation of physiography, lithology and structures.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**INTRODUCTION TO CARTOGRAPHY** Definitions, terms, concepts, types, history, applications, conventional cartography v/s digital cartography. Map: Types of map, map 26 scale, classes of maps. Map projection: fundamentals and types; Base Maps & Thematic Maps; Map Legend, Symbols & Border Information; label placement.	**(15 Hrs)**
UNIT II	**AERIAL PHOTOGRAPHY** History – Types Based On Camera Axis, Altitude, Film. Lens and angle of Coverage. Scale of Photographs: Definition – Derivation – Determination of Scale in Vertical Photo over Flat and Variable Terrain, Average Photo Scale, Scale in Tilted Photographs – Scale Distortions due to Lens, Flying height, relief, tilt, pitch, yaw, roll.	**(15 Hrs)**
UNIT III	**CAMERA SYSTEM** Parts of Simple Camera – Aerial Cameras – Camera Calibration Lens System – Distortions and Aberrations–Spectral Sensitivity of Aerial Cameras–Films Photographic Resolution –	**(15 Hrs)**

	Radiometric Characters of Aerial Photographs. Stereo models: Monoscopic Observation – Stereoscopy – Psuedoscopy – Base Height Ratio Stereo model Observation – Height Measurement using Monoscopic and Stereoscopic Methods.	
UNIT IV	**PHOTO MOSAICS** Photo Indexing – Photo Mosaicing – Uncontrolled, Semi Controlled and Controlled – Ortho photography, Analog digital techniques, Flight Planning, Concepts of Map Projection Stereoscopic Plotting Instruments and Map Making: Stereo Plotters, Map Compilation Stereo Plotters – Automated Stereo Plotting instruments – Principles and Utility.	**(15 Hrs)**
UNIT V	**INTRODUCTION TO GPS** Definition, concept, GPS working principle, history and timeline, overview. Technical Description and GPS Observables: System Segmentation Space segment; control segment, user segment – types of receivers; GPS satellite signals, GPS data, position and time from GPS, code phase tracking, GPS positioning types – absolute positioning, differential positioning; Factors that affect GPS – number of satellites, multipath, ionosphere, troposphere, satellite geometry, satellite health, signal strength, distance from the reference receiver, DGPS and kinematic method, kinematic method. Real time DGPS.	**(15 Hrs)**

Text Books:

1. Robbinson, A.H. [1983], Elements of Cartography, John Wiley and Sons, New York.
2. Misra, R.P. and Ramesh, A. Fundamentals of Cartography, Prasaranga, Manasagangotri, Mysore,
3. Sarkar, A.K. Practical Geography - A Systmetic Approach, Orient Longman, Calcutta.
4. Singh, R.L. and Dutt, D.K. [1979]. Elements of Practical Geography, Kalyani Pub., New Delhi.

Reference Books:

1. Khan, Z.A, [1998]. Text Book of Practical Geography Concept, New Delhi.
2. Monkhouse, F.J. and Wilkinson, K.H.R (1994). Maps and Diagrams. Metheum, London. 27
3. Streets, J.A. [1994]. Map Projections University of London Press.
4. Pandey, S.N. [1957]. Principles of Application of Photogeology, Wiley Eastern New Delhi.
5. Alfred Leick 2007. GPS satellite surveying: John Wiley & Sons, New York.

Course Outcomes

On completion of the course students should be able to

CO 1: Students will be able to recognize explain the basic level fundamental cartography of map projection types.

CO 2: Student would understand the aerial photography history based on camera axis.

CO 3: Students will be able to recognize and explain basic camera system aerial cameras, films, photographic resolution and radiometric characters measurement.

CO 4: Students will be able to discuss the photo mosaics.

CO 5: Student would understand the technical description and GPS observables system.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	S	M	S	S	M	S	S	M
CO 2	M	S	S	M	S	S	M	S	S	M
CO 3	M	S	S	M	S	S	M	S	S	M
CO 4	M	S	S	M	S	S	M	S	S	M
CO 5	M	S	S	M	S	S	M	S	S	M

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Semester-V / Skill Based Elective - II	Basic Hydrology	Skill Based Elective: SBE – II
Instruction Hours: 2	**Credits: 2**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the origin of water resources. • To study the various components of hydrological cycle. • Understanding the groundwater occurrence and movement of aquifers. • To study the process and its features of watershed management. • To learn about the rain water harvesting method.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**ORIGIN OF WATER** Origin of Water – Water resources – Categorization of water resources – Surface water resources from Dams and Lakes.	**(5 Hrs)**
UNIT II	**HYDROLOGIC CYCLE** Hydrologic cycle – Various components of hydrological cycle – Precipitation, Run-off, Infiltration, Evaporation and transportation – Rain gauges and their distribution.	**(5 Hrs)**
UNIT III	**AQUIFERS** Groundwater occurrence and movement – Aquifers – Definition and types – Hydrogeological Properties of rocks .Basic Principles of groundwater exploration.	**(5 Hrs)**
UNIT IV	**PROCESS AND ITS FEATURES OF WATER** Running water – source – weathering, erosion, transportation and deposition – Process and its features – Water Shed Management.	**(5 Hrs)**
UNIT V	**RAINWATER HARVESTING** Rainwater harvesting – Definition, method and their importance.	**(5 Hrs)**

Text Books:

1. Alley. W.M. 1993. Regional groundwater quality – VNR – New York.
2. Arul P. 2000 A text book of Ground water, 1st Edition, 105 – 122
3. Bouwer, H., 1978, Groundwater Hydrology, McGraw – Hill Book Co., NY

Reference Books:

1. Davies, S.N., &Dewilest, R.J.M., 1966, Hydrogeology, John Wiley & Sons Inc
2. Fetter. C.W. 1990. Applied Hydrology. Merill Publishing.
3. Karanth. K.R. 1987. Groundwater assessments and management – Tata Mc-graw Hall
4. H. M. Raghunath 2007 Ground Water, New Age International, 520p.

Course Outcomes:

On completion of the course student should be able to

CO 1: Know the origin of water resources categorization.

CO 2: Understand the components of hydrologic cycle.

CO 3: Understand the quality of groundwater.

CO 4: Student would understand the source of water weathering, erosion, transportation and deposition of watershed management.

CO 5: Understanding the various of rainwater harvesting.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	S	M	M	S	S	S	S	S	M
CO 2	S	S	M	M	S	S	S	S	S	M
CO 3	S	S	M	M	S	S	S	S	S	M
CO 4	S	S	M	M	S	S	S	S	S	M
CO 5	S	S	M	M	S	S	S	S	S	M

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Semester-V / Skill Based Elective - III	**Natural Hazards, Remote Sensing and GIS**	**Skill Based Elective – SBE – III**
Instruction Hours: 2	**Credits: 2**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the natural hazards and their classification. • To study the earthquakes types of elastic waves. • Know the landslide driving forces and causes. • To study the remote sensing and it's the applications in geological sciences aerial platforms and resolution of satellite data. • To study the earth science of geological information system.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**TYPES OF NATURAL HAZARDS AND THEIR CLASSIFICATION** Introduction to natural hazards – Types of natural hazards and their classification.	**(5 Hrs)**
UNIT II	**EARTHQUAKES** Earthquakes – Types of elastic waves – Kinds of earthquakes – Seismograms – Richter's and movement scales – Causes, prediction and prevention of earthquakes.	**(5 Hrs)**
UNIT III	**LANDSLIDES** Landslides – Classification – Driving forces and causes – Mitigation of landslides.	**(5 Hrs)**
UNIT IV	**REMOTE SENSING AND ITS APPLICATIONS IN GEOLOGICAL SCIENCES** Introduction to remote sensing – Electromagnetic spectrum – Sensors – Aerial platforms – Resolution of satellite data – Visual interpretation of satellite images – Application of satellite remote sensing in geological sciences.	**(5 Hrs)**

UNIT V	GEOGRAPHIC INFORMATION SYSTEM (GIS)	(5 Hrs)
	Application of GIS in earth science, Basic principles of geographic information system – Basic geographic concepts – spatial awareness, spatial measurement, spatial location and reference, spatial patterns Map Basics: Nature of maps, map scale, map projections, Grid Systems for mapping. GIS data models: vector and raster data models.	

Text Book:

1. Gary L. Prost 2001. Remote Sensing for geologists Guide to Image Interpretation. Grdon and Breach Science Publishers pp.374.
2. Michale N. DeMers, 2005. Fundamental of Geographic Information Systems. Wiley India (p) Ltd. pp. 467.
3. Kang-Tsung Chang. 2002. Introduction to Geographic Information Systems. McGraw- Hill companies, pp 348.

References Book:

1. Ian Heywood, Sarah Cornelius and Steve carver. 2003. An Introduction to Geographic Information Systems, Pearson, pp 295.

Course Outcomes:

On completion of the course students should be able to

CO 1: Gain a better understanding of the geological types of natural hazards important volcanic, tsunami and flood plain.

CO 2: Understand the kinds of earthquake of seismograms Richter's and movement scales.

CO 3: Understand the nature of the landslide.

CO 4: Student would understand the remote sensing visual interpretation of satellite images.

CO 5: Understanding the geological information system basic concepts spatial awareness, measurement, location and reference patterns map.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	M	S	S
CO 2	S	S	S	S	S	S	S	M	S	S
CO 3	S	S	S	S	S	S	S	M	S	S
CO 4	S	S	S	S	S	S	S	M	S	S
CO 5	S	S	S	S	S	S	S	M	S	S

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W – Weakly Correlated

N – No Correlation

Semester-V& VI / Value Added Course – I	**Value Added Course Field Geology**	**Value Added Course VAC- I**
Instruction Hours: 30	**Credits: 4**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**
Course Objectives	• The paper aims to understand the field essentials like understanding a map, thebasic equipment's, traversing and field markings.
UNIT	**CONTENT**
UNIT I	Previous Literature and Maps, Destruction of Rocks, Physiography, Topographic Expressions and Relief, Inliers and Outliers, Soils and Vegetation, Requirements for the Field, Some Field Suggestions and Precautions.
UNIT II	Basic equipment, Additional requirements, Supplementary supplies, Special requirements, Optional, For mapping on aerial Photographs. Geological Hammers, Pocket and Hand Lenses, Hydrochloric Acid, Streak Plate, Pocket Knife, Measuring Tapes and Scales, Haversack or Rucksack, Mohs scale of Hardness, Cold Chisel, Protractors, Pocket Calculator, Cameras, Care and Upkeep of Instruments.
UNIT III	The Compass and Its Uses, Dip of the Compass Needle, Magnetic Declination, Clinometer, Bearing and Reading Directions, Measuring Attitudes, Handling of the Compass, Finding Direction without a Compass.
UNIT IV	Base Maps, Scale of Maps, Direction of Relief, Latitudes and Longitudes, Map Grids Measurement of the Map Areas, Mounding and Folding of Field Maps, Marking on Maps.
UNIT V	The Notebook, Notes, Checklist for Notes, Writing Materials, Field Sketches and Drawings, Field Photographs. Trimming of Hand Specimens, Fossil Specimens, Mineral Specimens, Samples and Samplings, Numbering and Labelling of Specimens, Packing and Storage.

Text Books:

1. Davis, G.R. 1984, Structural Geology of Rocks and Region, John Wiley24
2. H.W. Fairborn, 1949, Structural petrology of deformed rocks, John Wiley and sons
3. John Suppe 1985, Principles of Structural Geology, prentice Hall publications.

Reference Books:

1. Price N.J., and Cosgrove, J.W. 1990. Analysis of Geological structures, Cambridge Univ. Press.
2. Ramsay, J.G. and Huber, M.I., 1987, Modern structural Geology Vol. I and II Academic press.
3. Robert R. Compton, 1962, Manual of field geology, John Wiley and sons.

Course Outcomes

On completion of the course students should be able to

CO 1: Students would be able to understanding the field geology origin of important rocks, minerals, soils and vegetation inliers and outlier topographically destruction.

CO 2: Students understand the field basic equipment handling and requirements.

CO 3: Understand the compass its uses rock and mineral direction.

CO 4: Understand the student using base map latitude and longitude direction.

CO 5: Gain a better understands the field writing materials, field sketches and drawings.

Semester-VI / Value Added Course - II	**Value Added Course** **Spatial Modelling - Multi Displinary**	**Value Added Course VAC-II**
Instruction Hours: 30	**Credits: 4**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**
Course Objective	• Exposes the students to decision making and concepts of spatial decision support system.
UNIT	**CONTENT**
UNIT I	Development – Definition – Classification and Verification of spatial models – Spatial System Theory – Temporal modelling and dynamic description of geo objects.
UNIT II	Data models – Static models – Dynamic models – Cartographic models – Spatio – Temporal models – Network models – Models based on purpose – methodology and logic.
UNIT III	Basic statistic and its GIS expression – Spatial dependency – Spatial interpolation (IDW, Kringing and Others) – 3D models of relief.
UNIT IV	Linking numeric and geographic patterns – Normalizing maps – Viewing scatter plots – clustering mapped data – Investigating map correlation.
UNIT V	Dynamic map pedigree – Toward a human GIS – GIS softwar's changing roles – Evolving the GIS mindset – Multimedia mapping – Map display.

Text Books:

1. Carlo Gaetan& Xavier Guyon (auth), Spatial Statisstics and Modelling 2010

Reference Books:

1. Longley P.A, M.F. Goodchild, D.J. Maguire and D.W. Rhind 2005. John Wiley, Chichester Geographic Information System and Science. Second edition 2005

Web Resources:

https://www.pdfdrive.com/spatial-modelling-in-gis-and-r-for-earth-and-environmental-science-d183969339.html

Course Outcomes

On completion of the course students should be able to be

CO 1: Understand the concept architecture and frame work of SM and decision variables.

CO 2: Apply the SDSS in specified areas.

CO 3: Gain knowledge on types of decision modelling.

CO 4: Learn about various ranking, rating and composition methods involved in decision modelling.

Semester-VI / Course Code – VII	Igneous Petrology	Course Code: BGI
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To give a basic understanding of the mechanisms which control the diversity of igneous rocks • To emphasis the relationship between tectonic setting and igneous rock suites • To study the intrusive and extrusive igneous rocks • To study the various classification • To study the magmatic differentiation.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Definition of Petrology – Earth zones. Composition and constitution of magmas – Primary and Parental Magmas. Forms of Intrusive igneous rocks. Concordant forms – Sill, Laccolith, Lopolith and Phacolith, Discordant forms – Dykes, Cone Sheets, Volcanic neck, Ring dyke, Batholiths, Stocks, Bosses and Psymaliths. Forms of Extrusive igneous rocks: Lava flows, Pyroclastic deposits – Agglomerate, Lapilli, volcanic ash and volcanic froth.	**(18 Hrs)**
UNIT II	Structures vesicular and Amygdaloidal structures – block lava – Ropy lava – pillow structure – flow structure – sheet joints- mural jointing – columnar jointing – rift and grain. Textures: Definition and description – crystallinity: crystallites and microlites – Devitrification – Granularity – shapes of crystals, mutual relations – Equigranular textures: allotriomorphic hypidimorphic, Panidiomorphic. Inequigranular Textures: porphyritic and Intergrowth texture – Trachytic texture – Intergrowth texture strctures orbicular structure Spherulitic structure – Perlitic fracture. Directive textures, Overgrowth textures, Reaction textures – Micro Structures	**(18 Hrs)**

UNIT III	Classification: bases of classification – megascopic classification – classification based on colour index – based on the proportion of Alkali to plagioclase feldspars. Based on silica saturation – based on alumina saturation – A short account of CIPW classification, Normative minerals, salic and femic groups – mention of the main divisions, classes, orders, suborders, rangs and subrangs only. Merits and defects of CIPW classification – Tyrrels tabular classification.	**(18 Hrs)**
UNIT IV	Texture, Mineralogy, Classification, and Modes of occurrence of: Granite, Granodiorite, Syenite, Diorite, Gabbro, their hypabyssal and volcanic equivalents. Petrographic characters, distribution in India and origin of Pegmatites, Lamprophyres, Alkaline rocks, Dunite, Peridotite and Anorthosites.	**(18 Hrs)**
UNIT V	Crystallization of Unicomponent magma – Crystallizations and petrogenetic significance of Binary magmas: Diopside – Anorthite, Eutectic system, Albite – Anorthite soild – solution system, Forestrite – Silica incongruent melting system and Ternary system (Ab – An – Di). Reaction principle and Bowen's reaction series – Causes for the diversity of Igneous rocks – Magmatic Differentitation: Fractional crystallization, liquid immiscibility, Assimilation – short notes on: Consanguinity, Variation diagrams and petrographic provinces.	**(18 Hrs)**
UNIT VI	Merits and defects of CIPW classification – Tyrrels tabular classification – Structures vesicular and Amygdaloidal structures – block lava – Ropy lava – pillow structure – Forms of Extrusive igneous rocks: Lava flows, Pyroclastic deposits	**(18 Hrs)**

Text Books:

1. Tyrrel, G.W. 1978 The principles of petrology – Chapman and Hall Ltd., London.
2. Bowen, N.L. The Evolution of the Igneous Rocks – Dover publication, Inc, New York.
3. Barth, FW. 1962 Theoritical petrology – Wiley.
4. Walstrom, E.E. 1961 Theoritical Igneous petrology, Wiley.
5. Turner.F.J and Verhoogen.J –1960.- Igneous and Metamorphic petrology – McGraw Hill.
6. Hatch, F.H. Wells, A.K. Petrology of Igneous Rocks, Thomas Murby & Wells, M.K. – 1949
7. Johannesen, A – 1962 Descriptive petrography of Igneous Rocks, Vols. I to IV –Allied Pacific.

Course Outcomes

On completion of the course students should be able to

CO 1: Student would understand the paragenesis of minerals of the Igneous rocks.

CO 2: This course presents a broad review of igneous rocks, emphasizing their tectonic associations, interrelationships and petrogenesis.

CO 3: After successful completion of this course you will have an integrated understanding of the range, composition and petrogenesis of the major igneous rock groups and will be able to identify them in thin section and deduce their tectonic association and mode of origin.

CO 4: Students will become familiar with the key skills used to aid the interpretation of igneous rocks.

CO5: Students will become major igneous rock groups and will be able to identify megascopic and microscopic studies.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

S – Strongly Correlated

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Semester-VI / Course Code – VIII	Sedimentary Petrology and Metamorphic Petrology	Course Code: BGJ
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• Knowing the basic concepts in the classification of sedimentary rocks. • Knowing the processes that erode, transport, and deposit sediments. • Observing physical characteristics of sedimentary rocks, especially mineral composition and texture. • To become familiar with the petrographic nomenclature of sedimentary rocks. • To learn about the occurrence, origin, classification and environments of sedimentary rocks.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Sedimentary process – disintegration & decomposition of rocks – transportation – deposition – diagenesis. A broad classification of sedimentary rocks into residual mechanical, chemical and organic Groups. Structures of sedimentary rocks. Mechanical, chemical and organic structures. Textures of sedimentary rocks – clastic and non – clastic textures.	**(18 hrs)**
UNIT II	Residual deposits – terra rossa, clay, laterite and bauxite and soils. Mechanical deposits – rudaceous, arenaceous and argillaceous groups. Heavy minerals in sand and sandstones. A descriptive study of Conglomerate, Breccia, Sandstones and Shales.	**(18 hrs)**
UNIT III	Chemical deposits – siliceous, carbonaceous, ferruginous and salt deposits. Organic deposits – calcareous, siliceous, phosphatic, ferruginous and carbonaceous deposts. A breief study of Flinit, Chert, Siderite, Gypsum, Rock Salt, Caliche. Guano and Kiesellgher. Descriptive study of different types of calcareous and carbonaceous deposits.	**(18 hrs)**

UNIT IV	Definition of metamorphism – Agents and kinds of metamorphism – facies, zones and grades of metamorphism – metamorphic structures and textures. Cataclastic metamorphism and its products. Retrograde metamorphism. Thermal metamorphism of Breccia sediments, pure and impure calcareous rocks. A brief study of Breccia, Flaser, Mylonite, Hornfels, Marble, Ophicalcite.	**(18 hrs)**
UNIT V	Dynamorthermal metamorphism of Breccia sediments. Plutonic metamorphism petrography and origin of charnockites – metamorphic differentiation – pnumatolitic and injection metamorphism – anataxis and palingenesis. Brief study of Slate, Phyllite, Quartzite, Schist. Gneiss, Granulite, Leptynite, Charnockite, Ecologite, Amphibolite, Schorl, Adinole, Lit- Par – Lite – gneiss and Migmatite.	**(18 hrs)**
UNIT VI	Cataclastic metamorphism and its products – Descriptive study of different types of calcareous and carbonaceous deposits – Mechanical deposits – rudaceous, arenaceous and argillaceous groups.	**(18 Hrs)**

Text books:

1. Tyrrel, G.W – Principles of petrology, Asia Publishing House.
2. Huang, W.T. –Petrology, MC Graw Hill
3. Pettijhon, F.J. –Sedimentary Rocks, Harper & Bros.
4. Harker, A. –Petrology for Students, Cambridge,

Reference Books

1. Turner,F,J &Verhogen,J –Igneous and Metamorphic Petrology, MC Graw Hill.
2. Williams, H, Turner, F.j. & Gillibert, C.M. – Petrography, Freeman.
3. Winkler, A. G.F. – Petrogenesis of Metamorphic Rocks, Mc Graw Hill.

Course Outcomes

On completion of the course students should be able to

CO 1: Student would understand the weathering, provenance, depositional environments, climate and tectonics of the sedimentary rocks.

CO 2: Demonstrate proficiency in common practical skills in Sedimentary Geology.

CO 3: Interpret the processes responsible for the deposition of the sediment from the nature of the sediment and sedimentary structures present within the sedimentary rock.

CO 4: Understand the depositional environment of a sedimentary rock package based on recognition of facies associations.

CO5: Student would understand the petrological studies in megascopic and microscopic

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

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N – No Correlation

Semester-VI / Course Code – IX	Economic Geology	Course Code: BGK
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the basic terminology and classification of ore localization. • To study the magmatic processes. • Geochemical properties of earth's crust, mantle and core and the fundamentals of geochemical measurements for the exploration and energy resources. • To study the physical properties of ore minerals. • To study the occurrence and distribution of ore minerals.	
UNIT	**CONTENT**	**HOURS**
UNIT I	Historical development of economic Geology. Materials of mineral deposits – ore minerals, gangue minerals, tenor and grade or ores. Classification of mineral deposits. Outline of Lindgren's and Bateman's classification. Controls of ore localization – structural controls, stratigraphic physical and chemical – brief study of metallogenetic epochs and provinces – geologic thermometers.	**(18 Hrs)**
UNIT II	Magmatic processes. – Mode of formation – Early magmatic processes and deposits, disseminations. Segregations and injections – Late magmatic processes and deposits – Residual liquid segregation and injection – immiscible liquid segregation and injection – sublimation. Contact Metasomatic processes – the process and effects – resulting mineral deposits. Hydrothermal processes – principles – Factors affecting deposition – wall rock alteration – minerals sequence – cavity filling deposits Fissure veins, shear – zone, stock- work, saddle reef, ladder vein, fold cracks, 59 Breccias filling, solution cavities, pore space and vesicular filling – replacement deposits, the process and deposits – criteria of replacement.	**(18 Hrs)**

UNIT III	Sedimentary processes and cycles – principles involved in sedimentation – cycles of Iron and manganese, weathering processes – principles- Residual concentration process and deposits – mechanical concentration principles – evluvial, alluvial, beach and eolian placers – paystreak and bonanza. Oxidation and supergene sulphide enrichment – solution and deposition in the zone of oxidation – secondary sulphide enrichments – Gossans and capping. Metamorphic processes – Formation of Graphite, Asbestos, Talc, Soapstone and Sillimanite group of minerals.	**(18 Hrs)**
UNIT IV	Diagnostic physical properties, chemical composition, uses, modes of occurrence and distribution in India of the following economic minerals. Graphite, Realgar, Orpiment, Stibinite, Molybdenite, Cinnabar, Anglesite, Barite, Gypsum, Celestite, Corundum, Ochre, Ilmenite, Chromite, Franklinite, Cassiterrite, Magnesite, Cerussite, Halite, Fluorite, Phosphatic Nodule, Monazite, Wollastonite, Colembite, Tantalite, Samarskite, Asbestos, Steatite and Vermiculite. Mineralogy, mode of occurrence, uses and distribution in India of the following precious metals and minerals. Gold deposits – Gem stones. Character, distribution and mode of occurrence of structural and building materials.	**(18 Hrs)**
UNIT V	Mineralogy, mode of occurrences, uses and distribution in India of the following metalliferous deposits – Iron, Manganese, aluminium, copper, lead, Zinc – chromium. Fossils fuels – coal – uses, classification, constitution, origin and distribution in India. Petroleum – composition, uses, theories of origin, oil traps, and important oil fields of India.	**(18 Hrs)**
UNIT VI	Classification of minerals deposits – Hydrothermal processes Metamorphic processes – Formation of Graphite – Gold deposits – Gem stones. Character, distribution and mode of occurrence of structural and building materials – Petroleum – composition, uses, theories of origin, oil traps, and important oil fields of India.	**(18 Hrs)**

Text Books:

1. Bateman Allan .M. –Economic Mineral Deposits, Asian Publishing House, 2nd Edition 1962.

2. Lindgren W. –Mineral Deposits, MCGraw Hill, 1933.

Reference Books:

1. Coggin, B. and Dey, A.K. – India's Mineral Wealth, Oup 1955.
2. Park, C.F. and Macdiarmid, R.A- Ore deposits, Freeman, 1970
3. Krishnaswamy, S. – India's Mineral Resources, oxford and IBH.
4. Deb.S. – Industrial Minerals and Rocis of India, Allied, 1980.
5. Gokhale, K.V.G.K. and Rao , T.C- Ore deposits of India, their distribution and processing, Thosmson press, 1978.

Course Outcomes

On completion of the course students should be able to

CO 1: An understanding of the socio-economic drivers for mining and exploration activities.

CO 2: Detailed knowledge and the ability to interpret the strength, of the various genetic models associated with each class of mineralization; with emphasis on the mineralogy, geology and geochemical controls on mineralization of ore deposits.

CO 3: An understanding of the roles of a geologist in the mining and exploration industries.

CO 4: Students able to understand the ore minerals in the field.

CO5: An understanding of the megascopic and microscopic identified minerals.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	M	S	S	S	S	S	S	S	S	S
CO 2	M	S	S	S	S	S	S	S	S	S
CO 3	M	S	S	S	S	S	S	S	S	S
CO 4	M	S	S	S	S	S	S	S	S	S
CO 5	M	S	S	S	S	S	S	S	S	S

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Semester-VI / Core Practical – IV	Petrology and Economic Geology	Course Code: BGY
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks: 40	External Marks: 60	Total Marks: 100

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the megascopic identification of igneous, sedimentary and metamorphic rocks. • To study the microscopic identification of igneous, sedimentary and metamorphic rocks. • To study the megascopic identification of ore minerals. • To study the occurrence and distribution of rocks and ore minerals. • To study the industrial minerals.	
UNIT	**CONTENT**	**HOURS**
	PETROLOGY: **MEGASCOPIC IDENTIFICATION OF THE FOLLOWING ROCKS** Granite, Graphic granite, Pegmatite, Aplite, Schorl Rock, Granite Porphyry, Syenite, Syenite porphyry, Diorite, Gabbro, Anorthosite, Dunite, Pyroxenite, Dolerite, Diabase Porphyry, Basalt, Trachyte, Rhyolite, Obsidian, Pumice, Scoria. Conglomerate, Breccia, Sandstone, Arkose, Shale, Limestone, Laterite, Peat, Lignite, Slate, Phyllite, Schists, Gneisses, Quartzite, Marble, Amphibolite, Ecologite, Leptynite, Charnockite, Khondalite, Calc – Granulite and Basic Granulite.	**(18 Hrs)**
	MICROSCOPIC IDENTIFICATION AND DESCRIPTION OF THE FOLLOWING ROCKS Mica Granite, Hornblende Granite, Tourmaline Granite, Schorl Rock, Aplite, Graphic Granite, Mica Syenite, Hornblende Syenite, Nepheline Syenite, Diorite, Gabbro, Norite, Dunite, Peridotite, Granite – porphyry. Syenite – porphyry, Diorite – porphyry, dolerite, minette, Vogasite, Anorthosite, Trachyte, Andesite, basalt, phonolite, volcanic Breccia, vitrophyre, conglomerate, Breccia, sandstone, Arkose, shale limestone, slate, chlorite schist, mica schist, Kyanite schist, Staurolite schist, garnetiferous schist, Glaucophane schist, Granulite, Charnockite, Ecologite Amphibolite, Leptynite, khondalite, Cordierite, gneiss, garnet – Sillimanite gneiss Calc Granulite.	**(18 Hrs)**

	ECONOMIC GEOLOGY:- **MEGASCOPIC IDENTIFICATION AND DESCRIPTION, INDIAN OCCURRENCES AND USES OF THE FOLLOWING ORE AND INDUSTRIAL MINERALS** Realgar, Orpiment, Stibnite, Molybdenite, Galena, Sphalerite, Cinnabar, Covelite, Bornite, Chalcophyrite, Pyrite, Arsenopyrite, Marcasite, Barite, Celestite, Gypsum, Cuprite, Zincite, Corundum, Hematite, Ilmenite, Magnetite, Chromite, Franklinite, Cassiterite, Rutile, Pyrolusite, Psilomelane, Goethite, Limonite, Bauxite, Calcite, Dolomite, Magnesite, Siderite, Aragonite, Witherite, Strontionite, Cerussite, Azurite, Malachite, Chrysocolla, Columbite, Halite, Fluorite, Phosphatic Nodule, Monazite, Graphite, Coal and its varieties.	**(18 Hrs)**

Course Outcomes

On completion of the course students should be able to

CO 1: Students able to identify the megascopic minerals in the field.

CO 2: Understand the microscopic thin section of rocks.

CO 3: Students able to identify the ore minerals in the field.

CO 4: Understand the various uses of economic minerals.

CO 5: Students able to identify industrial ore minerals.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO 1	S	S	S	S	S	S	M	S	S	S
CO 2	S	S	S	S	S	S	M	S	S	S
CO 3	S	S	S	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	M	S	S	S
CO 5	S	S	S	S	S	S	M	S	S	S

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Semester-VI / Major Based Elective – III	Exploration Geophysics	Major Based Elective MBE – III
Instruction Hours: 5	**Credits: 5**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 -Recalling** **K2 -Understanding** **K3 -Applying** **K4 - Analyzing** **K5 - Evaluating** **K6 - Creating**	
Course Objectives	• To study the electrical methods of rocks through ground surface and apparent resistivity. • To study the magnetic methods field survey equipment. • Gain familiarity with a gravity method regional and residual anomaly. • To study the seismic velocities in earths materials. • To aim of the logging methods using the borehole geophysics data processes and interpretation.	
UNIT	**CONTENT**	**HOURS**
UNIT I	**ELECTRICAL METHODS** Electrical properties of rocks, Flow of current through ground surface, apparent resistivity, Electrode arrangements (Wenner, Schlumberger method) VES (Vertical Electrical Sounding) – qualitative interpretation and quantitative interpretation of VES curves for groundwater exploration.	**(15 Hrs)**
UNIT II	**MAGNETIC METHODS** Geomagnetic field, Induced magnetism, Remenent magnetism, Susceptibility, Field survey method, Equipment, Data processing, Qualitative and quantitative interpretation of magnetic data.	**(15 Hrs)**
UNIT III	**GRAVITY METHODS** Gravitational force; Gravitational acceleration; Gravitational potential, Earth's gravitational field, Collections; corrections and presentation of Gravity data, Regional and residual anomalies. Induced Polarization Methods: Earth's polarization, IP measures, Time and frequency domain techniques, Field surveys, Equipments, Data acquisition and interpretation.	**(15 Hrs)**

UNIT IV	**SEISMIC METHODS** Basic principles, Types of seismic waves and their propagation characteristic, Seismic velocities in Earth's materials, Refraction and reflection seismic methods: Basic principal, field procedure, data acquisition and interpretation, Siesmicstartigraphy, Radiometric Methods: Basic principles, radioactive elements in rocks, Data collection and interpretation.	**(15 Hrs)**
UNIT V	**LOGGING METHODS** Borehole geophysics – well logging, electric logging, radioactive logging, induction logging, Sonic logging – Airborne survey, Data acquisition, Equipment, Measurement, Data processing and interpretation.	**(15 Hrs)**

Text Books:

1. Ramachandra Rao, M.B., Prasaranga, 1975. Outlines of Geophysical Prospecting - A manual for geologists by University of Mysore, Mysore.
2. Bhimasarikaram V.L.S. 1990. Exploration Geophysics - An Outline by, Association of Exploration Geophysicists, Osmania University, Hyderabad,.
3. Dobrin, 1984. An introduction to Geophysical Prospecting by, M.B. McGraw Hill, New Delhi.

Reference Books:

1. Telford W.M. Geldart L.P., Sheriff, R.E. and Keys D.A. 1976, Applied Geophysics. Oxford and IBH Publishing Co. Pvt., Ltd. New Delhi.
2. Parasnis, D.S 1975.Principles of applied Geophysics, Chapman and Hall.

Course Outcomes

On completion of the course students should be able to

CO 1: Understanding the electrical methods Wenner and Schlumberger arrangement of groundwater exploration.

CO 2: Students would understand the magnetic methods using the groundwater qualitative and quantitative data interpretation.

CO 3: Understand the earth's gravitational field, collections, corrections and presentation of gravity data.

CO 4: Students would be able to understand the seismic velocities in earth's materials, refraction and reflection seismic methods.

CO 5: Gain a better understanding of the sonic logging airborne survey, data acquisition, equipment, measurement, data processing and interpretation.

Mapping of Course outcomes with Programme outcomes/ Programmes Specific outcomes

CO	PO					PSO				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	S	S	S	S	S	S	M	S	S	S
CO 2	S	S	S	S	S	S	M	S	S	S
CO 3	S	S	S	S	S	S	M	S	S	S
CO 4	S	S	S	S	S	S	M	S	S	S
CO 5	S	S	S	S	S	S	M	S	S	S

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FIELD TRAINING PROGRAMME

As an essential part of the course, students should be taken for a field training programme during an academic year.

First Year

Students should be taken on a local field trip to study the elementary aspects of geomorphology, structural geology, for about a week and submit a report thereon.

Second Year

Study of Palaeontological and Stratigraphically interested areas and collection of fossils. Student should submit a field report along with collections at the time of practical examinations: Duration of visit about 10 days.

Third Year

Visit to geologically interested and mineralized zones of India. Mine visit and collection of minerals and rocks. Duration of visit is 15 days.