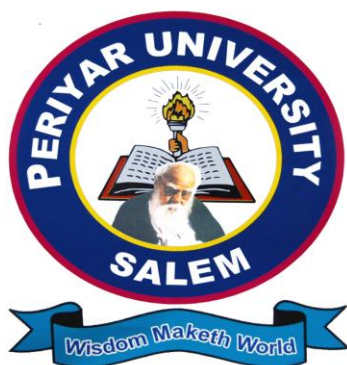


**PERIYAR UNIVERSITY  
PERIYAR PALKALAI NAGAR  
SALEM – 636 011**



**DEGREE OF BACHELOR OF  
SCIENCE**

**CHOICE BASED CREDIT SYSTEM**

**SYLLABUS FOR - B.Sc. APPLIED GEOLOGY**

**FOR THE STUDENTS ADMITTED FROM THE  
ACADEMIC YEAR 2012 – 2013 ONWARDS**

# Regulations

## 1. Eligibility for Admission

Candidates for admission to the first year of the Degree of Bachelor of science under Branch. VII – Applied Geology course are required to have passed the Higher Secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu or an examination as equivalent to 10 +2 courses including CBSE, which have been recognized by the Periyar University.

The candidates for admission to the Branch VII Applied Geology shall have passed the qualifying Examination with the subjects under any one of the following groups.

- Group – I (Maths, Physics, Chemistry and Computer Science)
- Group – II (Maths, Physics, Chemistry and Biology)
- Group – III (Physics, Chemistry, Zoology and Botany)

For admission of students in the Government/Aided/ Unaided Colleges of Arts and Science, guidelines issued by the Director of Collegiate Education, Chennai – 6 may be followed.

## 2. Eligibility for the Award of Degree

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed course of study in a college affiliated to the Periyar University for a period not less than three academic years/six semesters, passed the examination prescribed and fulfill such conditions have been prescribed therefore. The Eligibility for award of degree is based on the candidate fulfill in the part IV student component.

## 3. Requirement for Proceeding to II and III years

Candidates shall be eligible to proceed from first year to final year only if they earn sufficient percentage of attendance prescribed by the Syndicate of the Periyar University from time to time for the I and II year of the course. All candidates must put in 75% of attendance. The Syndicate of Periyar University has resolved that the minimum attendance requirement for condonation be fixed at 65% with condonation fee. The attendance will be calculated on the basis of 180 working days/900 instructional hours for semester courses and a uniform 75% attendance prescribed for all I, II and III year courses/ all semesters for eligibility to appear for the year end/semester end examinations.

Candidates will be permitted to appear for the practical examinations only if they have attended 75% of the practical classes prescribed for each subject, condonation of shortage of attendance for practical classes will be granted by the Principal/Heads of the Departments up to a maximum of 65% of the total number of practical classes. The condonation fee for practical is applicable for shortage of attendance.

Candidates who have put in less than 50% of attendance have to repeat the course (by rejoining) for which they lack attendance without permitting them to proceed for II or III year until they earn the required percentage of attendance for that particular year.

## 4. Passing Minimum

A candidate shall be declared to have passed in each paper/practical wherever prescribed if he/she secures not less than 40% of marks prescribed for the examination. He/she shall be

declared to have passed the whole examinations, if he/she passed in all papers and practicals wherever prescribed as per the scheme of examinations.

## 5. Classification of Successful Candidates

Foundation Courses (Languages and English) and Core courses (Major and Allied Subjects):- Successful candidates passing the foundation and core courses and securing 60% and above in the aggregate shall be declared to have passed the examinations in the First class. Securing 50% and above but below 60% in the aggregate shall be declared to have passed the examinations in the Second Class. All other successful candidates shall be declared to have passed the examinations in the Third class. Candidates who obtain 75% marks and above in any subject shall be deemed to have passed that subject with Distinction provided they pass all the examinations at the first appearance.

## 6. Ranking

Candidates who passed all the examinations prescribed for the course in the first appearance only are eligible for ranking.

## 7. Age Limit for Admission

As per the guidelines issued by the Government of Tamil Nadu, the upper age limit for admission to undergraduate courses will be 21 years as on 1<sup>st</sup> July.

## 8. Distribution of Marks

	<b>Internal</b>	<b>Exam</b>	<b>Total</b>
<b>Theory</b>	25	75	100
<b>Practical</b>	40	60	100
<b>Project</b>	Viva voce – 25	Report -75	100

Core practical marks 40 further divided as follows:-

Field visit, Collections, Report - 20

Practical records - 10

Practical Quiz - 10

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40  
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Classification of Internal Assessment for Theory: Test 15, Assignment 5, Attendance 5 = 25

Study Components	No. of Courses	Credit per Course	Total Credits	
<b>Part – I</b> Tamil / Other Languages	2+2=4	3	12	
<b>Part – II</b> English	2+2=4	3	12	
<b>Part – III</b> Core Courses	12	4	48	95
Core Practical	4	3	12	
Allied Theory	4	3	12	
Allied Practical	2	4	8	
Project/ Elective	1	15	15	
<b>Part – IV</b> 1. (a) Those who have not studied Tamil upto XII Std. and taken a non-Tamil language under Part-I shall take Tamil comprising of two courses (level will be at 6 <sup>th</sup> standard)				
(b) Those who have studied Tamil upto XII Std and taken a non-Tamil language under Part-I Shall take Advanced Tamil comprising of two courses				
(c) Other who do not come under a+b can choose non-major elective comprising of two courses				
	1+1=2	2	4	
2. Skill Based Elective Courses	3+3=6	2	12	
3. Environmental Studies	1	2	2	
4. Value Education	1	2	2	
<b>Part –V</b> Extension Activities (NSS, NCC, YRC, RRC, Green Club)	1	1	1	
<b>Total</b>			<b>140</b>	

(For the students admitted from the year 2012-13 onwards)

Sem	Part	Course	Paper Code	Title	Hrs.		Credit	Marks		Total
					L	T / P		Int	Extn	
I	I	Language –I	12UFTA01	Tamil –I	6	-	3	25	75	100
	II	Language -II	12UFEN01	English – I	6	-	3	25	75	100
	III	Core Course-1	BGC01 12UAG01	Physical Geology and Geodynamics	4	-	4	25	75	100
		Core Practical- I	BGCP 01 12UAGP01	Structural Geology and Surveying		3				
		Allied Theory –I	12UCHA01	Inorganic, Organic and Physical Chemistry-I	4	-	3	25	75	100
	IV	Allied Practical- I	12UCHAP01	Chemistry Practical		3				
		Environmental Studies	12UESE01	Environmental Studies	1	-				
		Value Education	12UVE01	Value Education	1	-	-	-	-	-
		SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
	II	I	Language –I	12UFTA02	Tamil – II	6	-	3	25	75
II		Language –II	12UFEN02	English –II	6	-	3	25	75	100
III		Core Course – II	BGC02 12UAG02	Geomorphology and Structural Geology	4	-	4	25	75	100
		Core Practical- I	BGCP01 12UAGP01	Structural Geology and Surveying	-	3	4	40	60	100
		Allied Theory- II	12UCHA02	Inorganic, Organic and Physical Chemistry –II	4	-	3	25	75	100
		Allied Practical- I	12UCHAP01	Chemistry Practical	-	3	4	40	60	100
IV		Environmental Studies	12UES01	Environmental Studies	1	-	2	25	75	100
		Value Education	12UVE01	Value Education	1	-				
		SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
III	I	Language –I	12UFTA03	Tamil –III	6	-	3	25	75	100
	II	Language – II	12UFEN03	English –III	6	-	3	25	75	100
	III	Core Course- III	BGC03 12UAG03	Paleontology	4	-	4	25	75	100
		Core Practical- II	BGCP02 12UAGP02	Paleontology and Stratigraphy	-	3				
		Allied Theory – III	12UPHA1/ 12UPHA01	Physics –I	4	-	3	25	75	100
		Allied Practical- II	12UAGP02	Physics Practical	-	3				
	IV	SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
		NMEC *	BGNME01-04	From List –VIII for NMEC	2	-	2	25	75	100
IV	I	Language - I	12UFTA04	Tamil – IV	6	-	3	25	75	100
	II	Language - II	12UFEN04	English –IV	6	-	3	25	75	100
	III	Core Course –IV	BGC04 12UAG04	Principles of Stratigraphy and Indian Geology	4	-	4	25	75	100
		Core Practical - II	BGCP02 12UAGP02	Paleontology and Stratigraphy	-	3	4	40	60	100
		Allied Theory – IV	12UPHA02	Physics –II /	4	-	3	25	75	100

			AM02	Maths - II						
		Allied Practical-IV		Physics Practical - II	-	3	4	40	60	100
	IV	SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
		NMEC *	BGNME01-04	From List –VIII for NMEC	2	-	2	25	75	100
		Value Education	12UVE01	Value Education	1	-	2	25	75	100
V	III	Core Course – V	BGC05 12UAG05	Crystallography and Optical Mineralogy	3	2	4	25	75	100
		Core Course - VI	BGC06 12UAG06	Mineralogy	3	2	4	25	75	100
		Core Course - VII	BGC07 12UAG07	Igneous Petrology	3	2	4	25	75	100
		Core Course –VIII	BGC08 12UAG08	Sedimentary and Metamorphic Petrology	3	2	4	25	75	100
		Core Practical- III	BGCP 03 12UAGP03	Crystallography and Mineralogy	-	4	-	-	-	-
		Core Practical- IV	BGCP 04 12UAGP04	Economic Geology and Petrology	-	4	-	-	-	-
		Project	BGPR01	-	-	4	-	-	-	-
	IV	SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
VI	III	Core Course – IX	BGC09 12UAG09	Economic Geology	3	2	4	25	75	100
		Core Course - X	BGC10 12UAG10	Remote Sensing and Exploration Geology	3	2	4	25	75	100
		Core Course – XI	BGC11 12UAG11	Mining and Engineering Geology	3	2	4	25	75	100
		Core Course –XII	BGC12 12UAG12	Hydrogeology and Environmental Geology	3	2	4	25	75	100
		Core Practical- III	BGCP 03 12UAGP03	Crystallography and Mineralogy		4	4	40	60	100
		Core Practical- IV	BGCP 04 12UAGP04	Economic Geology and Petrology		4	4	40	60	100
		Project	BGPR01	Project	4	-	15	25	75	100
		SBEC	BGE01-10	From List –VII for SBEC	2	-	2	25	75	100
		Extn				-	1			
		<b>Total</b>					<b>140</b>			<b>4100</b>

SBEC- Skill Based Elective Courses

\* Any other language course

\*NMEC – Non Major Elective Courses – refer study components part IV

### III. LIST OF CORE COURSES

BGC01	-	Physical Geology and Geodynamics
BGC02	-	Geomorphology and Structural Geology
BGC03	-	Paleontology
BGC04	-	Principles of Stratigraphy and Indian Geology
BGC05	-	Crystallography and Optical Mineralogy
BGC06	-	Mineralogy
BGC07	-	Igneous Petrology
BGC08	-	Hydrogeology and Environmental Geology
BGC09	-	Economic Geology
BGC10	-	Remote Sensing and Exploration Geology
BGC11	-	Mining and Engineering Geology
BGC12	-	Sedimentary and Metamorphic Petrology

#### **IV. LIST OF CORE PRACTICALS**

BGCP01	-	Structural Geology and Surveying
BGCP02	-	Palaeontology and Stratigraphy
BGCP03	-	Crystallography and Mineralogy
BGCP04	-	Petrology and Economic Geology

#### **V. LIST OF ALLIED THEORY SUBJECTS**

- Inorganic, Organic and Physical Chemistry – I
- Inorganic, Organic and Physical Chemistry – II
- General physics Head Optics and electricity  
(OR)
- Algebra, Calculus and Vector Analysis -I
- Modern Physics, Sopectroscopy and Electronics  
(OR)
- Integration and Differential Equations

#### **VI. LIST OF ALLIED PRACTICALS**

- Chemistry Practical
- Physics Practical

#### **VII. LIST OF SKILL BASED ELECTIVE COURSE**

BGE01	-	Field Hydrogeology and Techniques
BGE02	-	Geostatistics & Computer Applications
BGE03	-	Gemology and Gemstone Evaluation
BGE04	-	Basics of Photogrammetry
BGE05	-	Granite exploration and exploitation
BGE06	-	Mines and Minerals Legislation of India
BGE07	-	Introduction to Geoinstrumentation
BGE08	-	Water quality analysis
BGE09	-	Mapping Techniques in Geology
BGE10	-	Geology for competitive examination.

## **VIII. LIST OF NON-MAJOR ELECTIVES COURSES**

- BGNME01 - Basic Geochemistry
- BGNME02 - Basic Geophysics
- BGNME03 - Geohazards
- BGNME04 - Groundwater Management and Rain Water Harvesting

## **IX. LIST OF COMPULSARY COURSES**

- Value Education
- Environmental Studies
- Extension Activities (NSS,NCC,YRC,RRC,Green Club)



**Time: 3 hours**

**Max. Marks: 75**

**Part - A**

**(10 x 2 = 20)**

Answer all questions  
Each Answer shall be in about 30 words

**Part - B**

**(5 x 5 = 25)**

Answer all questions with internal choice  
Each answer shall be in about 300 words

**Part – C**

**(3 x 10 = 30)**

Answer **any three** out of five  
Each answer shall be in about 1000 words

**First year - First Semester  
Core Course– I**

**BGC01 - Physical Geology and Geodynamics**

### **Unit – I**

Geology: Scope and importance, branches of Geology. Solar System: Planets, Satellites, Asteroids, Meteorites and Comets. Origin of Solar system: Nebular, Planetesimal, and Tidal hypotheses – Earth in the Solar system: Size, Shape, Mass, Density, Rotational and Revolution parameters. Brief description of lithosphere, Hydrosphere, Atmosphere, Biosphere and their composition.

### **Unit – II**

Age of the Earth: Age determining Methods: Indirect method: salinity method, sedimentation method tree- ring or growth rings, Lichenometric method, Direct method: Ur-Pb method, K-Ar method Rb-Sr method, C<sup>14</sup> method, Interior of the Earth: Structure and composition of Crust, Mantle and Core.

### **Unit –III**

Earthquake: Definition, Focus, epicenter. Measurement of earthquake: seismograph, seismogram Richter's scale, Magnitude, Intensity. Earthquake belts of the world with a special reference to India. Volcanoes: Definition, Types, Causes and Effects, Volcanic Products, Volcanic landforms, Distribution of volcanoes, volcanoes in India.

### **Unit – IV**

Dynamic Earth: Isostasy, origin and evolution of oceans, Geosynclines, Profile of continental margins, Island arcs.

### **Unit – V**

Continental Drift, Sea floor spreading theory and evidences: Plate Tectonics.

### **Text Books**

1. Porter and Skinner. 1992. Principles of Physical Geology. John Wiley
2. Arthur Holmes. 1992. Principles of Physical Geology, Vol. 1, Chapman and Hall, London
3. Mahabathra G.B. 1994 Text book of Physical Geology C.B.S publishers, Delhi
4. Radhakrishnan. V 1996 General Geology. V.V.P. Publishers, Tuticorin.
5. Parbin Singh 2000 A text book of Engineering and General Geology, S.K.Kataria and sons, Delhi.
6. P.C.Sanjeeva Rao and D.Bhaskara Rao. Text book of Geology 2004. Discovery Publishing House, New Delhi.
7. P.K. Mukerjee. 1997. Text book of Geology. World Press

### **Reference books**

1. Porter and Skinner 1992 Principle of Physical Geology, IV John wiley & sons.

**First Year – First Semester**  
**Allied Theory – I**  
**- Inorganic, Organic and Physical Chemistry – I**

## Unit – I

### 1.1 Chemical Bonding ,

Molecular Orbital Theory-bonding, antibonding and nonbonding orbitals.

M.O. diagrams of Hydrogen, helium, Nitrogen, Fluorine and Nitric Oxide-discussion of bond order and magnetic properties.

1.2 Hydrides-classification and characteristics preparation, properties and uses of Borazole,  $\text{NaBH}_4$  and  $\text{LiAlH}_4$ .

1.3 Carbonyls-mononuclear and polynuclear carbonyls-Examples.

Preparation, properties and structure of  $\text{Cr}(\text{CO})_6$ ,  $\text{Fe}(\text{CO})_5$  and  $\text{Ni}(\text{CO})_4$ .

## Unit –II Nuclear Chemistry

2.1 Fundamental particles of Nucleus – nuclide, isotopes, isobars and isotones

2.2 Natural radioactivity–radioactive series including Neptunium series-Group displacement law.

2.3 Nuclear Binding energy, mass defect – Calculations.

2.4 Nuclear Fission and Nuclear Fusion – differences – Stellar energy.

2.5 Artificial Radioactivity – Preparation of transuranium elements – Np,Pu,Cf,Es, and No.

2.6 Applications of radioisotopes – C-14 dating, rock dating, isotopes as tracers, study of Reaction mechanism (ester hydrolysis) radiodiagnosis and radiotherapy.

## Unit – III

3.1 Covalent Bond- Orbital Overlap- Hybridisation – Geometry of Organic molecules- methane, Ethylene, Acetylene and Benzene.

3.2 Electron displacement Effects: Inductive, Resonance, Hyper conjugative & steric effects. Their effect on the properties of compounds..

3.3 Stereoisomerism: Symmetry – elements of symmetry-cause of optical activity, Tartaric acid. Racemisation. Resolution. Geometrical isomerism of Maleic and Fumaric acids-Keto-enol tautomerism of Acetoacetic ester-conformers of n-butane with brief explanation

## Unit – IV

4.1 Aromatic compounds-Aromaticity –Huckel’s rule

4.2 Electrophilic substitution in Benzene – Mechanism of Nitration, Halogenation –Alkylation, Acylation.

4.3 Isolation, preparation, properties and structure of Naphthalene Haworth’s synthesis.

4.4 Heterocyclic compounds:- Preparation, properties and uses of Furan, Thiophene, Pyrrole and Pyridine.

4.5 Preparation and uses of  $\text{CHCl}_3$ ,  $\text{CCl}_4$ , Saccharin and Freon.

## Unit – V

5.1 Solutions: Liquid in liquid type – Raoult’s law for ideal solutions. Positive and negative deviation from Raoult’s law Reasons and examples, Fractional distillation and Azeotropic distillation.

5.2 Colligative properties: Review of colligative properties of dilute solutions-lowering of V.P, elevation of B.Pt and depression of F.Pt and osmotic pressure. Reverse osmosis. Abnormal molecular weights-van’t Hoff factor –degree of dissociation and association- problems.

5.3 Chromatography: principle and application of column, paper and thin layer chromatography.

## **Unit-I**

Definition and scope of geomorphology. Brief introduction to geomorphic cycles and classification of landforms.

Wind as a geological agent: - definition – cause – erosional, transport, and depositional activity – landforms created by wind action: sand dunes and their types – yardangs – loess. Short account of Indian deserts.

Lakes as a geological agent: Definition – origin – classification – deposits – landforms – created by lakes – short account of Indian lakes.

## **Unit-II**

Rivers as a geological agent: - definition – origin – types – erosional, transport, and depositional activity – fluvial landforms due to erosion and depositions – drainage patterns – stages in the rivers life cycle – stream capture and piracy – river rejuvenation – short account of Indian rivers.

Underground Water as a geological agent: erosional and depositional activity of underground water: Karst topography.

## **Unit-III**

Glaciers as a geological agent: Definition – formation – types – movement – glacial erosion and deposition – landforms – glaciofluvial deposition – landforms – glaciofluvial deposits – causes of glaciation – short account of Indian glaciers. Sea and oceans as a geological agent: Definition, waves geological work of wave action – geological work of waves – coastal landforms created by waves – shoreline and their types. Submarine geomorphology:- feature of continental margins and deep ocean basins – submarine canyons. Types of ocean sediments and deposits. Coral reefs and atolls. Short account of Indian coasts.

## **Unit-IV – Structural Geology**

Introduction and scope of structural geology. Introductions to topographical and geologic maps- map scale.

Outcrops: Definition – types - attitude and apparent dip – trends of outcrops - measurement of attitude, or an outcrop using on Brunton and Clinometer compass

Outcrops configuration of rocks:-

Igneous rocks:- Concordant bodies sills, laccolith, lopolith – phacolith. Discordant bodies: dykes, stocks and batholiths. Volcanic lava flows. Metamorphic features: brief introduction of foliation and lineation and their use geological mapping.

Sedimentary rocks:- Bedding and layers – types of bedding: graded, cross, current. Surface sediment features:- mudcracks, rain imprints, and ripple marks.

## **Unit-V**

Physical properties of rocks: - rock deformation- brittle, plastic and elastic properties of rocks.

Joints: - definition types – classification.

Folds: Definition – parts of a fold systems – criteria for recognition in field and on a map – short note on outliers, inliers, and drag folds.

Faults:- definition-Parts of faults- classification-criteria to distinguish fault from unconformities-criteria for field and map recognition of faults.

Unconformities:- definition-types – recognition in field and in geological maps-geological significance.

## **Reference**

1. Holmes.A(1992).Principles of Physical Geology, Vol. 1, Chapman and Hall, London
2. Bloom,A.(1985).Geomorphology. Prentice Hall,New York
3. Radhakrishnan.V.(1996).General Geology ,V.V.P Publication Tuticorin.

4. Mahapatra,G.B.(1994).Text book of physical Geology CBS,Delhi.
5. Mathur ,S.M(2003).Physical Geology of India 2<sup>nd</sup> Ed,NBT,Delhi.
6. Billings,M.P.(1987).Structural Geology,CBS.Delhi.
7. Gokhale ,N.W.(1996).Theory of Structural Geology, CBS, Delhi.
8. Sathyanarayana Swami,B.S(1994).Structural Geology Dhanpatrai and sons, Delhi.
9. Ray,A.K(1982),Introduction to the study of geological maps,2<sup>nd</sup> Ed World phen, Calcutta
10. Davis, G.H. (1985). Structural Geology of rocks and region, Wiley, Newyork

**First Year – Second Semester  
Core Practical –I**

**BGAP01- Structural Geology and Surveying**

**Study of Topographic maps:**

Identification of land forms, major structures such as Fold, Fault, Joint, Unconformities and Intrusions.

**Uses of Clinometer and Brunton Compass:**

Laboratory exercises in Structural Geology maps - contours – Completion of outcrops.

**Three point problems**

- (1) Fold maps
- (2) Fault maps
- (3) Unconformity maps

**Combination of any two structures:**

Such as Fold and Fault, Fault and Unconformities.

Drawing of cross – sections across the geological maps to bring out the structure of the area.

Interpretation of structures, determining the Order of Superposition of beds.

An account of geological sequences that affected the area.

Exercise on structural geology problems/Graphical determination of Dip in gradient.

Determination of True dip by simple calculation.

Determination of Apparent dip by Graphical method.

Determination of Thickness of bed by calculation, on a level ground.

**Surveying:**

Chain Surveying: Open traverse, closed traverse.

Prismatic compass surveying: Determination of the distance between two inaccessible stations.

Radiation method, Method of intersection

Plane table surveying: Determination of the distance between two inaccessible stations.

Radiation Method, Method of intersection

Leveling: Rise and fall method.

**Reference books:**

- |                            |   |   |
|----------------------------|---|---|
| Punna                      | - | Surveying vol I & II                    |
| Gokale                     | - | Structural Geology practical manual     |
| Compton                    | - | Field Geology                           |
| Lashee                     | - | Field Geology                           |
| Hussain S.K & M.S. Nagaraj | - | Text book of Surveying (1992) S.Chand & |

**First Year –Second Semester  
Allied Theory – II**

**–Inorganic, Organic and Physical Chemistry – II**

**Unit – I**

- 1.1 Co-ordination chemistry – definition of terms – classification of ligands – Nomenclature – Chelation – Examples. Chelate effect – explanation
- 1.2 Werner's theory – conductivity and precipitation studies. Sidgwick's theory – Effective Atomic Number concept.
- 1.3 Pauling's theory – postulates-Application to octahedral, square planar and tetrahedral complexes. Pauling's theory and magnetic properties of complexes. Merits and demerits of Pauling's theory.
- 1.4 Biological role of Haemoglobin and Chlorophyll (Elementary idea of structure and mechanism of action).
- 1.5 Application of coordination compounds in qualitative and quantitative analysis- separation of Copper and Cadmium ions, Nickel and Cobalt ions- identification of metal ions like Cu, Fe and Ni Quantitative estimation of Ni using DMG, Aluminium using Oxine.
- 1.6 EDTA and its application.
- 1.7 Environmental chemistry: Discussion of the following-Green house effect and global warming Ozonal Hole, Acid rain. BOD and COD and its importance. Sewage treatment – Rainwater harvesting its need, methods and advantages – Solid waste disposal.

Noise pollution, Radioactive pollution – health hazards.

**Unit – II**

- 1.1 Carbohydrates: Classification, preparation and properties of Glucose and Fructose- discussion of open chain and ring structure of Glucose. Mutarotation Preparation and properties of Sucrose. Structure (detailed discussion of structure not necessary) Properties of Starch, Cellulose and derivatives of Cellulose. Inter conversion of Glucose to Fructose and vice versa.
- 1.2 Amino Acids-Classification, preparation and properties of Glycine. And Alanine. Preparation of peptides (Bergmann method only).
- 1.3 Proteins: Classification according to composition, biological function and shape. Denaturation of proteins.

**Unit - III**

- 3.1 Chemotherapy: Preparation, uses and mode of action of sulpha drugs-prontosil, sulphadiazine and sulphafuazole. Uses of penicillin, chloramphenicol and streptomycin, Definition and one example each for – analgesics, antipyretics, tranquilizers, sedatives, hypnotics, local anaesthetics and general anaesthetics
- 3.2 Polymer chemistry: Classification of polymers – natural and synthetic – rubber, cellulose, starch, polyamides, polyesters, PVC – (starting materials and uses only). Special properties of polymers.

## Unit – IV

- 7.1 Photochemistry: Grotthus – Draper law and Stark – Einstein’s law of photochemical equivalence. Quantum yield. Example for photochemical reactions – Hydrogen- Chlorine reaction (elementary idea only) Photosynthesis. Phosphorescence, Fluorescence, Chemiluminescence and Photosensitisation – definition with example.
- 7.2 Phase Rule: Phase rule and the definition of terms in it. Application of phase rule to water system. Reduced phase rule and its application to a simple eutectic system (Pb-Ag) Freezing mixtures.

## Unit – V

- 1.1 Electro chemistry: Kohlrausch law – measurement of conductance, pH determination. Conductometric titrations. Hydrolysis of salts.

Deviation of  $K_h$ , pH and buffer action in living system. Galvanic cells-EMF – Standard electrode potentials, reference electrodes, electrochemical series and its applications. Principle of electroplating, pH determination

- 1.2 Corrosion: methods of prevention.

### Reference books:

1. Soni.P.L, Text Book of Inorganic Chemistry, Sulthan Chand & Sons.
2. Puri and Sharma, Text Book of Inorganic Chemistry- Vishal publications
3. Jain.M.K, Principles of Organic Chemistry – Vishal publishing Co.
4. Kundu and Jain, Physical Chemistry, S.Chand.
5. Puri,Sharma and Pathania, Text book of Physical Chemistry, Vishal Publishing Co

## First Year – Second Semester Allied Practical – I

### - Allied Chemistry

#### I. TITRIMETRY

- i. Estimate of Sodium hydroxide – Standard sodium carbonate.
- ii. Estimate of Hydrochloric acid – Standard Oxalic acid.
- iii. Estimation of Borax – Standard Sodium carbonate.
- iv. Estimation of Ferrous sulphate – Standard Mohr’s Salt.
- v. Estimation of Oxalic Acid – Standard Ferrous Sulphate.
- vi. Estimation of Sodium hydroxide- Standard Potassium permanganate
- vii. Estimation of Ferrous iron using diphenylamine as internal indicator.

#### II. ORGANIC ANALYSIS

- i. Detection of elements –nitrogen, sulphur and halogens.
- ii. Detection of aliphatic or aromatic
- iii. Detection of whether saturated or unsaturated compounds.

- iv. Preliminary tests and detection of functional groups: aldehydes, phenols, aromatic amines, aromatic acids, dicarboxylic acids, Urea, benzamide & carbohydrate.

**Second Year – Third Semester  
Core Course– III**

**BGC03 - Paleontology**

**Unit – I**

Definition of Fossil – Nature and modes of preservation of Fossils – Uses and significance of fossils – Index fossils – zone fossils – Geological Time Scale. General morphology, Classification, Geological history and Stratigraphical importance of the following invertebrates :

Phylum Mollusca – Classes – Pelecypoda, Gastropoda and Cephalopoda.

**Unit - II**

General morphology, Classification, Geological history and Stratigraphical importance of the following invertebrates:

Phylum Coelenterata - Class Anthozoa (Corals)  
Phylum Echinodermata - Classes – Echinoidea, Crinoidea and Blastoidea.

**Unit – III**

General morphology, Classification, Geological history and Stratigraphical importance of the following invertebrates :

Phylum Brachiopoda  
Phylum Arthropoda - Class Trilobita

**Unit – IV**

An outline of the classification of Vertebrates – Principles of Evolution as applied to vertebrate paleontology – Sequence of Vertebrates through geologic time – Evolution of Horse, Elephant, Dinosaurous and Man.

Phylum Hemichordata – Class Graptolithina (Graptozoa)

**Unit – V**

An outline of classification of Plant Kingdom – A short account of the following Plant fossils – Glossopteris – Gangmopteris – Calamites – Lepidodendron – Sigillaria – Ptilophyllum.

Introduction of important micro fossils Foraminifera, Ortoocods, Radiolaria Spores and pollens

**Text Books**

1. P.C. Jain and M.S. Anantharaman (2003) – Palaeontology – Evolution and Animal distribution – Vishal Publishing Co., Jalandhar.
2. Clarksons, E.N.K. (1998): Invertebrate Paleontology and Evolution, Allen and Unwin, London.
3. Henry Woods (1967). Invertebrate Palaeontology. Cambridge University Press, London.
4. Rhona M. Black (1972) – The Elements of Paleontology – Cambridge University Press.
5. Bernhard Kummel (1961). History of the Earth – W.H. Freeman and Company, San Francisco.
6. A. K. Ray. 2008. Fossils in Earth Scineces. Eatern Economy Edition

**Reference Books**

1. Raup, D.M. and Stanley, S.N. (1985) – Principles of Paleontology – CBS Publishers
2. Prothero, D.R. (2004): Bringing Fossil to Life – An Introduction to Paleontology, McGraw Hill.
3. Stanley, S. M. 1985. Earth and Life through time. Freeman & Co.
4. Edwin H. Colbert (1976) – Evolution of the Vertebrates – Wiley Eastern Ltd., New Delhi.
5. Arnold, C.A. (1947) An Introduction to Palaeobotany – Mc Graw Hill.



**Second Year – Third Semester  
Allied Theory– III**

**General physics**

**Unit-I**

**Mechanics, sound**

Projectile-range up and down an inclined plane-Impulse –impact –laws of impact-coefficient of restitution –direct impact between two spheres –Compound pendulum-theory-determination of acceleration due to gravity.

Production of ultrasonic waves –Piezo electric crystal method –application –acoustics of building –reverberation –reverberation time absorption coefficient –Sabine’s formula.

**Unit-II**

**Properties of matter**

Newton’s law of gravitation –determination of gravitational constant-Boyer’s method-bending of beams –expressions for bending moment –expression For the depression of the free end of the cantilever-uniform and uniform bending theory and experiment –torsion expression for couple per unit twist-torsion pendulum-theory rigidity modulus by static torsion-surface tension –excess pressure inside a curved liquid surface-surface tension and interfacial surface tension drop weight method.

**Unit-III Heat**

**Specific heats:** Determination of  $C_p$  and  $C_v$  –van –der-wal ‘s equation –critical constants and their determination-Expressions for Critical constants- Thermal conductivity of a bad conductor-Lee’s disk method

Joule –Thomson effect-porous plug experiment-theory-Inversion temperature-Boil temperature-Liquefaction of gases –Hydrogen and Helium-Adiabatic demagnetization.

**Unit IV: Optics**

Small angled prism – formation of two thin prisms to produce dispersion without deviation without dispersion – constant deviation spectroscopy – Interference – Air wedge – Thickness of a wire – Jamin’s interferometer – Raleigh’s interferometer- Polarisation – Specific rotatory power and its determination.

**Unit V: Electricity**

Carey Foster’s bridge – Theory – measurement of resistance – potentiometer Low range voltmeter and ammeter calibration – Theory of moving coil Ballistic Galvanometer – Determination of current and voltage sensitivities – Comparison of capacities –  $B_H$  curve – magnetometer methods.

**Books For Study And Reference**

1. Mechanics and mathematical methods - R. Murugesan, S Chand & Co.
2. Properties of matter and acoustics - R. Murugesan, S Chand & Co.
3. Heat and Thermodynamics - Brijlal and Subramaniam, S Chand & Co
4. Optics and Spectroscopy - R. Murugesan, S Chand & Co.
5. Electricity and Magnetism - R. Murugesan, S Chand & Co.

**Second Year – Third Semester  
Allied Theory– III**

**AM 01 - Algebra, Calculas and Vector Analysis -I**

**Unit -I**

**Matrices**

Characteristic Equation – Eigen values vectors – properties – problems – rank of matrix – problems – solutions of simultaneous using matrixes - consistency condition. (12 hours)

**Unit- II**

**Theory of Equations**

Polynomial equations – Relation between roots and coefficients –Imaginary roots and irrational roots – Solving equations under given conditions – Transformation of equations – Descarte s rule of signs.

**Unit- III**

**Differential Calculas**

Definition of derivative different types of differentiations –standard formula –successive differentiation –nth derivative – Leibnitz formula- problems (12 hours)

**Unit - IV**

Partial Differentiation – Euler’s theorem –Curvature –Radius of curvature in Cartesian and polar co-ordinates (12hours)

**Unit - V**

**Vector Anaysis**

Gradient  $\phi$ , divergence and curl of a vector point function – solenoidal and irrotational vectors-unit normal vector-directional dervative –problems. Vector Integration-Stoke’s theorem,Gauss theorem and Green’s theorem-Statement only –application.

**Text Books;**

1. T.K Manickavasagam pillai-ALLIED MATHEMATICS S.Viswanathan &Co, Chennai.
2. P.R.Vittal-ALLIED MATHEMATICS Margham Publication, Chennai.
3. A.Singaravelu-ALLIED MATHEMATICS, Meenakshi Traders, Chennai.

## Core Course– IV

### BGC04 - Principles of Stratigraphy and Indian Geology

#### Unit – I

Principles and laws of stratigraphy - Correlations – concept of Homotaxis –Contemporaneity – Stratigraphic Nomenclature: Litho, Bio, Chrono Stratigraphic units – Geological Time Scale – Standard Geological divisions – Imperfections in geological records. Recent advancements in stratigraphy – definition of sequence stratigraphy.

#### Unit – II

Physiographic divisions of India – Structure and tectonic divisions of India: Peninsular India, Extra Peninsular India and Indo-Gangetic plains – Study of the Archaean groups – Dharwar System of Karnataka –Cuddapah Supergroup, Delhi Supergroup.

#### Unit – III

Study of the following geological formations of India: Vindhyan Supergroup, Kurnool Supergroup – Palaeozoic Formation: Cambrian of Salt range – Haimanta system of Spiti – Ordovician, Silurian and Devonian of Spiti – Carboniferous of Spiti and Kashmir – Permian of Salt Range and Spiti.

#### Unit – IV

Gondwana Sequence - Classification, Lithology, Deposits, Fossils, Climate and Economic Importance – Triassic of Spiti – Jurassic of Kutch – Cretaceous of Trichinopoly and Narmada Valley.

#### Unit – V

Deccan Traps – Distribution, Structure – Lameta beds – Intertrappean and Infratrappean beds – Bagh beds. Tertiary Succession: Rise of Himalayas –Geological succession of Assam, Tamil Nadu and Kerala – Siwalik Group– Pliocene ice ages in India – Karewa formation – Recent formation: Alluvial deposits.

#### Text Books

1. M.S. Krishnan (1986). Stratigraphy of India and Burma, Higginbothams, 6<sup>th</sup> Edition.
2. D.N. Wadia (1953). Geology of India, Tata McGraw- Hill Company Ltd., New Delhi.
3. Ravindrakumar (1985) Fundamentals of Historical Geology and Stratigraphy of India, Wiley Eastern Ltd., New Delhi.
4. Pascoe, E.H. (1968): A Manual of the Geology of India and Burma (Vols.I-IV), Govt. of India Press, Delhi.
5. Danbar, C.O. and Rodgers, J. (1957): Principles of Stratigraphy, John Wiley and Sons.

#### Reference Books

1. Sam Boggi Jr. (1987) – Principles of Stratigraphy and Sedimentology, Merrill Co.
2. A.J. Weller (1966) Stratigraphic Principles and Practice University Book Depot, New Delhi.
3. J.W. Gregory and B.H. Barrot – General Stratigraphy Methuen.
4. Doyle, P. and Bennett. M.R. (1996): Unlocking the Stratigraphic Record, John Wiley&Sons.

## Core Practical– II

### BGCP02 - Paleontology and Stratigraphy

#### **Paleontology:**

Identification of fossils on the basis of morphological characters and fixing the biological position and range in geological time for the following classes of fossils.

- Pelecypods** : Meretrix, Arca, Cardium, Cardita, Pecten, Venus, Unio, Pinna, Modiola, Lima, Inoceramus, Lopho(Alectryonia), Gryphaea, Exogyra, Spondylus, Pectenculus, Radiolites, Trigonina and Ostrea.
- Gastropods** : Turritella, Cerithium, Turbo, Trochus, Natica, Conus, Fusus, Physa, Busycon, Voluta, Murex, Bellerophon, Helix, Cypraea, and Euomphalus.
- Cephalopods** : Orthoceras, Nautilus, Goniatites, Ceratites, Acanthoceras, Schloenbachia, Scaphites, Perisphinctes, Turritites, Baculites, & Belemnites.
- Brachiopods** : Lingula, Lingulella, Spirifer, Productus, Terebratula, Rhynchonella, Pentamerus, Atrypa and Athyris.
- Anthozoans** : Calceola Zaphrentis, Montilivaltia, Cistiphyllum, Thecosmilia, Cyclolites, Favosites, Omphyma, Halysites and Lithostroton.
- Echinoidea** : Echinus, Cidaris, Hemicidaris, Micraster, Holaster, Hemiaster and Stigmatophygus.
- Crinoidea** : Encrinus, Apiocrinus and Pentacrinus
- Blastoidea** : Pentremites.
- Trilobites** : Paradoxides, Calymene, Olenellus, Olenus, Asaphus, Trinucleus, Phacops.
- Graptolites** : Monograptus, Rastrites, Diplograptus, Phyllograptus, Tetragraptus.
- Plant fossils** : Glossopteris, Gangamopteris, Ptilophyllum, Lepidodendron, Sigillaria, Stigmaraia, Calamities.
- Foramanifera:** Textularia, Quinqueloculina, Globigerina, Lagena and Nummulites.
- Porifera** : Siphonia and Ventriculites.
- Stratigraphy** : Arranging the different Indian Stratigraphic horizons in accordance with age, Stratigraphic position, fossil content and order of superposition.

## 06UPHA2- Modern Physics, Sopectroscopy and Electronics

### Unit – I: Atomic Physics

Vector Atom Model – Spatial Quantization – Spinning electron – Quantum numbers associated with vector atom model – Coupling schemes – LS coupling – jj coupling – Pauli's exclusion principle – Periodic classification of elements – example of electron configuration – Stern – Gerlach experiment.

### Unit – II

Nuclear models – liquid drop model – semi empirical mass formula – Merits and demerits – Shell model – evidences – Collecgtive model

Nuclear radiation detectors – Ionisation chamber – Geiger Muller counter – Wilson cloud chamber – Bubble chamber

Particle accelerators – Synchronocyclotron – Betatron Solid State

Physics – Bonding in crystals – ionic bond – covalent bond – metallic bond – molecular bond – hydrogen bond

### Unit – III

Molecular spectra – Theory of pure rotational spectrum – origin of vibratin – rotation spectrum – electronic spectra – Laser Raman spectroscopy – Resonance spectroscopy =- Basic theory of NMR and ESR.

### Unit – IV

Semiconductor physics – construction and characteristics of FET, SCR,UJT – Phase shift oscillator working with theory – multivibrator – astable – monostable –bistable – basic circuits – Operational amplifier as differentiator and integrator.

### Unit – V Digital Electronics

Binary, octal hexadecimal numbers and their inter conversion – Laws of Boolean algebra – De Morgan's theorems – NAND/ NOR as Universal building blocks – Karnaugh mapping – Pairs – quads – octets – simplification of Boolean expressions – Half and full adder – Half and full subtractor.

### Books for study

Modern Physics, R.Murugesan S Chand & Co Twelfth edition  
Digital Principles and applications, Malvino & Leach TMH  
Principles of Electronics – VK Mehta S Chand & Co

### Books for refrence

Modern Physics J.B. Rajan S Chand & Co  
Hand book of Electronics Gupta & Kumar Pragathi Prakashan

## AM 02 – Integration and Differential Equations

### Unit – I INTEGRATION

Integration by parts  $\int_0^{\frac{\pi}{2}} -\sin x \, dx$ ,  $\int_0^{\frac{\pi}{2}} x \cos^n x \, dx$ ,  $\int_0^{\frac{\pi}{2}} \tan^n x \, dx$ ,  $\int_0^{\frac{\pi}{4}} x^n e^{ax} \, dx$ ,  $\int_0^a e^{-x} x^n \, dx$ -

Definite integrals – Properties – Reduction formulae – problems.

### Unit – II ORDINARY DIFFERENTIAL EQUATIONS

Second order differential equations with constant coefficients 0- Particular integrals of the type  $e^{ax}$  V- differential equations with variable Coefficients.

### Unit – III PARTIAL DIFFERENTIAL EQUATIONS

Definition – Complete, + - singular and general integrals – Solutions of standard types  $f(p,q) = 0$ ,  $f(x,p,q) = 0$ ,  $f(y,p,q) = 0$ ,  $f(z,p,q) = 0$ ,  $f_1(x,p) = f_2(x,p)$  – Clairant's form – Lagrange's equations  $Pp + Qq = R$ - problems.

### Unit – IV LAPLACE TRANSFORM

Definition – Laplace transform of standard functions – simple theorems – proplems – Inverse Laplace transform – solving second order differential equations using Laplace transforms

### Unit – V FOURIER SERIES

Definition – Fourier Coefficients – Periodic functions with period  $2\pi$  - Half range series – Cosine series – Sine series – problems.

#### Text books:

1. T.K. Manickavasagam pillai – ALLIED MATHEMATICS. S. Viswanathan & Co, Chennai.
2. P.R. Vittal – ALLIED MATHEMATICS. Margham Publications, Chennai.
3. A. Singaravelu, ALLIED MATHEMATICS. Meenakshi Traders, Chennai.

## Physics Practical

1. Young's modulus – non uniform bending – pin and microscope
2. Young's modulus – uniform bending – pin and microscope
3. Torsion pendulum – rigidity modulus
4. Static torsion – rigidity modulus
5. Surface tension and interfacial surface tension – drop weight method
6. Specific heat capacity of liquid – method of mixtures – half time radiation correction
7. Lee's disc – coefficient of thermal conductivity of a bad conductor
8. Sonometer – frequency of fork.
9. Air Wedge – thickness of wire
10. Newton's – radius of curvature
11. Spectrometer – I – d curve
12. Spectrometer – dispersive power of a grating
13. Potentiometer – ammeter calibration
14. Field along the axis of a coil – BH
15. Voltage regulator using Zener diode.
16. DeMorgan's theorems using ICs.

**Unit – I Yoga and Physical Health**

- 1.1 Physical Structure – Three bodies – Five Limitations
- 1.2 Simplified Physical Exercises – Hand Exercises – Leg Exercises – Breathing Exercises – Eye Exercises – Kapalapathi
- 1.3 Maharasanas 1-2 – Massages – Acu-Puncture - Relaxation
- 1.4 Yogasanas – Padmasana – Vajrasanas – Chakrasanas(Side) – Viruchasanas – Yoga Muthra – Patchimothasanas – Ustrasanas – Vakkarasanas – Salabasanas

**Unit – II – Art of Nurturing the life force and Mind**

- 2.1 Maintaining the Youthfulness – Postponing the ageing process
- 2.2 Sex and Spirituality – Significance of sexual vital fluid – Married life – Chastity
- 2.3 Ten stages of Mind
- 2.4 Mental frequency – Method for concentration

**Unit – III – Sublimation**

- 3.1 Purpose and Philosophy of life
- 3.2 Introspection – Analysis of Thought
- 3.3 Moralization of Desires
- 3.4 Neutralization of Anger

**Unit – IV – Human Resources Development**

- 4.1 Eradication of worries
- 4.2 Benefits of Blessings
- 4.3 Greatness of Friendship
- 4.4 Individual Peace and World Peace

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**VALUE EDUCATION**  
**மனவளக்கலையோகா**

**80 hours**



<b>Units</b>	<b>Title of the Paper</b>	<b>Hrs of Instruction</b>
<b>Unit – I</b> Yoga and Physical Health (16 Hours)	1.1 Physical structure of human body	(4 hours)
	1.2 Simplified Physical Exercises	(4 hours)
	1.3 Maharasanas	(4 hours)
	1.4 Yogasanas	(4 hours)
<b>Unit – II</b> Art of Nurturing life force and Mind (16 Hours)	2.1 Maintaining youthfulness	(4 hours)
	2.2 Sex and Spirituality	(4 hours)
	2.3 Ten stages of Mind	(4 hours)
	2.4 Mental frequency	(4 hours)
<b>Unit – III</b> Sublimation (16 Hours)	3.1 Purpose of life	(4 hours)
	3.2 Analysis of Thought	(4 hours)
	3.3 Moralization of Desire	(4 hours)
	3.4 Neutralization of Anger	(4 hours)
<b>Unit – IV</b> Human resource development (16 Hours)	4.1 Eradication of Worries	(4 hours)
	4.2 Benefits of Blessings	(4 hours)
	4.3 Greatness of Friendship	(4 hours)
	4.4 Individual Peace	(4 hours)
<b>Unit – V</b> Law of Nature (16 Hours)	5.1 Cause and Effect system	(4 hours)
	5.2 Purity of thought and Deed	(4 hours)
	5.3 Love and Compassion	(4 hours)
	5.4 Cultural Values	(4 hours)

**Third Year – Fifth Semester  
Core Course– V**

**BGC05 - Crystallography and Optical Mineralogy**

## **Crystallography:**

### **Unit – I**

Definition of crystals – Morphological characters: Faces – Edges – Solid angles – Interfacial angles – Contact Goniometer and its uses – Laws of crystallography – Axial ratio – Parameters – Indices and Symbols – Millerian system of notation – Symmetry Elements: Axis of symmetry, Plane of symmetry, Centre of symmetry – Classification of crystals into Systems: Forms – Holohedral, Hemihedral, Hemimorphic and Enantiomorphous forms.

### **Unit – II**

Cubic System – Study of the Symmetry elements, Forms and representative minerals of Normal, Pyritohedral, Tetrahedral and Plagiohedral classes. Tetragonal System – Study of the Symmetry elements, Forms and representative minerals of Normal, Hemimorphic, Tripyramidal, Pyramidal – hemimorphic and Sphenoidal classes. Hexagonal Division – Study of the Symmetry elements, Forms and representative minerals of Normal, Hemimorphic, Tripyramidal and Trapezohedral classes. Rhombohedral Division – Rhombohedral, hemimorphic Trirhomboidal and Trapezohedral classes.

### **Unit – III**

Orthorhombic System – Study of the Symmetry elements, Forms and typical minerals of Normal, Hemimorphic and Sphenoidal classes. Monoclinic system – Study of the Symmetry elements and Forms of the Normal class. Triclinic System – Study of the Symmetry elements and Forms of the Normal class. Twinning : Definition, Types of twinning – Laws of Twinning – Composition plane – Twin plane – Twin axis.

## **Optical Mineralogy:**

### **Unit –IV**

Nature of light - Ordinary light and Plane polarized light – Reflection and Refraction – Refractive Index – Critical angle – Total internal reflection – Single refraction. Polarising / Petrological microscope and its parts - Behaviour of light in its passage through petrological microscope – Optical accessories and their uses – Gypsum plate – Mica plate – Quartz wedge.

### **Unit – V**

Classification of minerals: Isotropic and Anisotropic – Double refraction in Calcite – Nicol prism and its construction. Properties of Uniaxial and Biaxial minerals under parallel and crossed Nicols – Dichroism, Pleochroism/ Trichroism - Optic axis – Optic sign – Retardation – Birefringence; - Extinction – Types of Extinction, Extinction angle – Interference of light – Order of interference colours.

## **Text Books**

1. Kerr, P.F, 1977. Optical Mineralogy. McGraw Hill Book Co.
2. Klein, C.and Hurlbut, C, 2002. Manual of Mineralogy. John Wiley & Sons
3. E.S. Dana (1955) – A Text Book of Mineralogy – Wiley Eastern Ltd.,
4. H.H. Read (1976) – Rutley’s Elements of Mineralogy – Thomas Murby & Co., London.
5. P.R.J. Naidu (1967) – Johannsen’s Optical crystallography – Allied Publishers Pvt. Ltd.,
6. M.G. Chakrapani Naidu (1982) Optical Mineralogy – COSIP – ULP in Geology – Southern and Western Region, India.

## **Reference Books**

1. Cornelius .S. et.al. – Dana’s Manual of Mineralogy, John Wiley & Sons, New York.

- Philips Wm. Revell (1971) – Mineral Optics – Principles and Techniques – W.H. Freeman and company, San Francisco.
- Wahlstrom E.E. 1969, Optical crystallography John Wiley, New York.
- Bishop, Principles of Crystallography, Oxford.

### **Third Year – Fifth Semester**

#### **Core Course– VI**

#### **BGC06 - Mineralogy**

##### **Unit – I**

Mineral – Definition and Classification – General chemistry of Minerals – Bonding, Physical properties of minerals – Habit – Color – Streak – Luster – Fracture – Cleavage – Diaphaneity – Hardness – Specific gravity.

##### **Unit – II**

Characters of minerals depending upon heat – magnetism – electricity – radioactivity – Isomorphism – Polymorphism – Silicate structure.

##### **Unit – III**

Physical, chemical, optical properties and mode of occurrence of the following group of minerals – Quartz, Feldspar, Feldspathoid and Zeolite.

##### **Unit – IV**

Physical, Chemical, Optical properties and mode of occurrence of the following group of minerals – Olivine, Pyroxene and Amphibole.

##### **Unit – V**

Physical, Chemical and Optical properties of Mica and Garnet group of minerals. Descriptive study of the following minerals – Talc, Gypsum, Fluorite, Apatite, Calcite, Dolomite, Epidote, Chlorite, Tourmaline, Staurolite, Kyanite, Andalusite, Sillimanite, Corundum, Magnetite, and Hematite.

#### **Text Books**

- Klein, C. and Hurlbut, C, 2002. Manual of Mineralogy. John Wiley & Sons
- Bathey, H.H. 1986. Mineralogy for Students. Longman, London
- Dana .E.S. (1955), A Text Book of Mineralogy – Wiley Eastern Ltd.
- Brian Mason and. Berry L.G (1961) – Elements of Mineralogy W.H. Freeman & Co.,
- Read H.H. – (1974) – Rutley’s elements of Mineralogy, Thomas Murphy & Co.

#### **Reference Books**

- Kerr P.F. (1977), Optical Mineralogy McGraw Hill Company.
- Wahlstrom E.E. (1960), Optical, Crystallography, John Wiley New Delhi.
- Winchell A.N., (1968), Elements of Optical Mineralogy Part, Willey Eastern.

### **Third Year – Fifth Semester**

#### **Core Course– VII**

#### **BGC07 – Igneous Petrology**

## **Unit – I**

Introduction to igneous rocks – Magma - Composition and constitution of magma – Forms of igneous Rocks – Sills – Laccoliths – Lopoliths – Dykes – Phacoliths – Stocks & Batholiths. Structures of igneous rocks:- Vesicular and Amygdaloidal Structure – Blocky Lava and Ropy Lava - Pillow lava – Flow Structure.

## **Unit – II**

Textures of igneous rocks – crystallinity, granularity – shapes of crystals – Mutual relations of crystals – equigranular, inequigranular textures, porphyritic – poikilitic – ophitic – intergrowth and reaction textures – Classification of igneous rocks:- chemical, mineralogical, mode of occurrence, Tyrrell’s tabular classification.

## **Unit – III**

Crystallisation of unicomponent magma, crystallization of binary magma:- eutectic, diopside-anorthite system – solid solution series – albite-anorthite system, incongruent melting-forsterite-Silica system – Bowen’s reaction series – differentiation and assimilation.

## **Unit – IV**

Petrography and petrogenesis of the following acid and intermediate rocks: Granite, Granodiorite, Syenite, Diorite, Rhyolite, Dacite, Trachyte, Andesite, Pegmatite and Aplite.

## **Unit – V**

Petrography and petrogenesis of the following basic, ultrabasic and ultramafic rocks: Gabbro, Dolerite, Basalt - Monomineralic rocks: Dunite, Pyroxenite and Anorthosites - Short note on Carbonatite.

## **Text Books**

1. Tyrrell , G. W. 1985 The Principles of Petrology . B.I. Publication, Chennai
2. W.T. Huang. 1962. Petrology - McGraw Hill
3. Ehlers, E.G., and Blatt, H. 1982. Petrology - Igneous, Sedimentary and Metamorphic. W. H. Freeman and Co.
4. Winter, J.D. 2001. Igneous and Metamorphic Petrology. Prentice Hall, New Jersey.

## **Reference Books**

1. Petrology of the igneous rocks - F.H. Hatch and Wells, CBS
2. Petrography, - H. Williams, F.J. Gilbert, S.L.M
3. Interpretation of Phase diagrams - W.G. Ehlers, E.G

## **Sedimentary Petrology**

### **Unit – I**

Introduction to sedimentary rocks – weathering – disintegration and decomposition of rocks, sedimentary processes, transportation and depositional environments – non-marine, transitional and marine. Classification of sedimentary rocks by Tyrrell and Pettijohn

### **Unit – II**

Textures of sedimentary rocks: grain size, concept of grain size – grain shape – sphericity and roundness – porosity, permeability and grain packing. Sedimentary structure: mechanical, chemical and organic.

### **Unit – III**

Petrography of the following sedimentary rocks: conglomerate, breccias, sandstones, shale and mudstone, limestone, dolomite, laterite and bauxite, guano, coal and its varieties - Elements of lithification and diagenesis.

## **Metamorphic Petrology**

### **Unit – IV**

Definition – agents and kinds of metamorphism – structures and textures of metamorphic rocks – zones of metamorphism. Classification of metamorphic rocks. A brief study on metamorphic grades and facies. Cataclastic metamorphism and its products – slate and slaty cleavage, crush-breccia, Cataclasite, flaser rocks and mylonites, phyllonites.

### **Unit – V**

Contact and thermal metamorphism and its products – thermal metamorphism of clay and calcareous rocks – contact metamorphism of clay and calcareous rocks – thermal metamorphism of arenaceous rocks. Dynamothermal metamorphism and its products. - A brief account on migmatites, charnockites, metasomatism and retrogressive metamorphism - Anatexis and palingenesis.

## **Text Books**

1. Tyrrell, G. W. 1985 The Principles of Petrology. B.I. Publication, Chennai
2. W.T. Huang. 1962. Petrology - McGraw Hill
3. Ehlers, E.G., and Blatt, H. 1982. Petrology - Igneous, Sedimentary and Metamorphic. W. H. Freeman and Co.
4. Turner.F.J and Verhoogen.J –1960.- Igneous and Metamorphic petrology – McGraw Hill.
5. Winter, J.D. (2001): An Introduction to Igneous and Metamorphic Petrology, Prentice Hall, New Jersey.
6. S.M. Sengupta. 1996. Introduction to Sedimentology. Oxford & IBH Publishing Corporation Pvt. Ltd., Kolkata.
7. Pettijohn, F.J. (1972). Sedimentary Rocks. CBS Publishers.

## **Reference Books**

1. Bose, M.K. (1997): Igneous Petrology, World Press, Kolkata.
2. Best, Myron G. (2002): Igneous and Metamorphic Petrology, Blackwell Science.
3. Petrology of the igneous rocks - F.H. Hatch and Wells, CBS
4. Petrography, - H. Williams, F.J. Gilbert, S.L.M
5. Interpretation of Phase diagrams - W.G. Ehlers, E.G

6. Metamorphism - A.Harkar, London,
7. Metamorphic Petrology - B.Baskar Rao, Oxford, New Delhi.
8. Blatt, H. and Tracy, R.J. (1996): Petrology (Igneous, Sedimentary, Metamorphic), W.H. Freeman and Co., New York.

**Third Year – Sixth Semester  
Core Course – IX**

**BGC09 - Economic Geology**

**Unit -I**

**Definition and scope of economic geology.**

Concepts of ore, gangue, tenor, grade, Host rock, and economic value of ore. Classification of mineral Deposits after Lindgren & Bateman. Syngenetic and Epigenetic mineral deposits, Controls of ore localization.

**Unit -II**

**Proceses of ore formation I**

Magmatic concentration – Sublimation – Contact metasomatic – Metamorphic – Sedimentation

**Unit- III**

**Proceses of ore formation II**

Hydrothermal: cavity filling and replacement – outline of ore shoot – Oxidation and Supergene enrichment, Residual and Mechanical concentration- Evaporite deposits – Bactriogenic ore deposits

**Unit-IV**

**Metallic mineral deposits of India**

Mineralogy, genesis, modes of occurrence and distribution of the following ore deposits in India:-Iron ore deposits, Gold deposits, Copper, Lead, Zinc and Aluminium ore deposits.

**Unit-V**

**Industrial minerals**

Physical properties, chemical composition, origin and distribution in India of the minerals used in the following industries: Abrasive, Refractory, Cement, Glass, Ceramic, Paint and Pigments, Fertilizers.

**Fuel Geology:** Brief outline of Coal and Petroleum, its origin and occurrence in India.

**Text book and reference**

1. Bateman, A.M & M.L Jensen (1981). Economic mineral deposits. Wiley & Sons New York.
2. Umeshwar Prasad (2003), Economic Mineral Deposits, CBS, Delhi.
3. Krishnaswamy, S. (1988) India's Mineral Resources. Oxford & IBH, Delhi.
4. Deb, S.(1985), Industrial Mineral and Rocks of India, Oxford & IBH, Delhi.
5. Banerjee, D.K (1998), Mineral Resources of India. World Press, Kolkatta
6. Iyyangar, N.K.N,(1964), Minerals of Madras, Dept of commerce and Industries, Guindy, Madras.
7. Gokhole, K.V.G.K and Rao, T.G (1972) Ore deposits of India, Oxford & IBH, Delhi.
8. Krishnan, M.S,(1957), Mineral resources of Madras, Memoir VSO, Geological Survey of India, Calcutta.
9. Coggin Brown J, and A.K Deb.(1995). Indian Mineral Wealth, Oxford press, Delhi.
10. Levorsen, A.T,(1985), Geology of Petroleum, CBS, Delhi.

**Third Year – Sixth Semester**  
**Core Course– X**  
**BGC10 - Remote Sensing and Exploration Geology**

**Unit – I**

Definition of Remote Sensing, importance and applications. Types of Aerial photographs – scales of aerial photographs – Mosaics – Flight procedures – Stereoscopes (Pocket lens and Mirror stereoscope). Recognising elements of photo-interpretation. Application of Aerial photographs in Geomorphology.

**Unit – II**

Satellite remote sensing. Electromagnetic spectrum – Interaction of electro-magnetic spectrum with Earth and Atmosphere. A short account of LANDSAT, Indian Remote Sensing satellites. Multispectral Remote Sensing, Microwave Remote Sensing. Application of Satellite Remote Sensing in Ground Water and Mineral Exploration.

**Unit – III: Geological Exploration**

Introduction: Ore genesis in relation to mineral Exploration. Guides to ore Deposits: - Physiographic, Mineralogical, Stratigraphic, Lithological and Structural guides. Geological techniques: evaluation of outcrops, Panning, Trenching, Pitting, Drilling. A short account of ore reserve estimation – Documentation of exploration data.

**Unit –IV : Geochemical Exploration**

Introduction – General principle : Mineral Deposits – Primary halo – Secondary halo – Background value – Interpretation – Sampling techniques – Pathfinder elements. A short account of methods of Geochemical Explorations: - Lithochemical – Pedogeological – Biogeochemical – Hydrogeochemical methods.

**Unit V: Geophysical Exploration**

Introduction – Electrical prospecting methods: Resistivity method: True and Apparent resistivity – Electrode arrangements – A short account of resistivity equipment. Magnetic method: Geomagnetic field and its variations – units of measurement – Magnetometers . Gravity method: Nature of gravity field and its variation – Practical units – Gravimeters.

**Text Books**

1. Arogyaswamy RNP (1980), Courses in Mining Geology, Oxford & IBH Publishers, New Delhi.
2. Panday, S.N (1996), Principles and applications of Photogeology – Wiley.
3. Prasnis (1972) Applied Geophysics – Chaparang Hall.
4. Ramachandra Rao M.B. (1975). Outlines of Geophysical prospecting – English Book Depot. Dehradun.
5. Lilesand and Keifer (2008) Remote Sensing 5<sup>th</sup> edition.

**Reference Books**

1. Curran Paul (1975), Principles of Remote sensing – ELBS.
2. Dobrin – Introduction of Geophysical prospecting – McGraw Hill.
3. Miller (1975) – Photogeology - McGraw Hill.
4. Sabins F.F. (1970), Remote Sensing – Freeman.
5. Sharma. P.V. (1976) – Geophysical methods in Geology Elsevier Pub.

**Third Year – Sixth Semester  
Core Course – XI**

**BGC11 - Mining and Engineering Geology**

**Unit – I**

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

**Unit – II**

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

**Unit – III**

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

**Unit – IV**

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

**Unit – V**

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

**Text Books**

1. Peter, W.C. 1978. Exploration and Mining Geology, Wiley
2. Mckinstry H.E. (1960). Mining Geology – Asia Pub. Co., Delhi.
3. Arogyaswamy R.N.P. (1988). Courses in Mining Geology – Oxford and IBH, New Delhi.
4. Parbin Singh (1991). A text Book of Engineering and General Geology – S.K. Kataria & Sons, Ludhiana Delhi.
5. Thomas L.J. (1973). An Introduction to Mining: exploration, feasibility, extraction, rock mechanics. Hicks, Smith & Sons.

**Reference Books**

1. Blyth F.H. (1995) – Geology for Engineers – ELBS (UK).
2. Fox C.S. (1935) – Engineering Geology.
3. Leggat R.M. Geology and Engineering – McGraw Hill.

**Third Year - Sixth Semester  
Core Course- XII**

**BGC12 - Hydrogeology and Environmental Geology**



## Hydrogeology

### Unit – I

Definition of Hydrology and Hydrogeology- Groundwater in Hydrologic cycle – Origin of Groundwater: - Meteoric water, Connate water, Magmatic water, Juvenile water, Metamorphic water; Water bearing formations:- Aquifers, Aquiclude, Aquifuge, Aquitard; Types of Aquifers:- Unconfined aquifer, Confined aquifers, Leaky aquifer.

### Unit –II

Vertical distribution of groundwater:- Water Table, Zone of Aeration, Zone of Saturation. Springs, Artesian well and Piezometric surface. Aquifer properties and Groundwater flow:- Porosity, permeability and Darcy's Law – Definition. Specific yield, Specific retention; Determination of specific yield.

### Unit – III

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

Groundwater Quality:- Physico-chemical and biological characteristics of Ground water. Hydrogen ion concentration ( $P^H$ ) – Total dissolved solids (TDS) - Specific conductance – Hardness – Mineral characteristics – Expression of analysis:- cations, anions:

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

## Environmental Geology

### Unit –IV

Introduction to Environmental Geology - A brief account of Energy system. Classification of Natural resources – Renewable and Non-renewable resources. Hazards and remedial measures relating to Earthquake, Tsunamis, Landslides, Floods and Soil erosion.

### Unit –V

Environmental degradation due to mining and mineral processing. Sources and causes of Groundwater pollution. Drinking water quality standards. Deforestation and Erosion. Environment management of radioactive waste.

## Text Books

### Hydrogeology

1. D.K. Todd (1980) – Groundwater Hydrology – John Wiley & Sons- New York.
2. P. Arul (2000) – Text book of Groundwater – Dhanam Agency – Tamil Nadu.
3. Ragnath (1987) – Ground water – Wiley Eastern Ltd – New Delhi.
4. Davis and De weist (1965) – Hydrogeology – John Wiley & Sons- New York

### Environmental Geology

1. A.N. Strahler and A.H. Strahler (1973) – Environmental Geo- Science – Hamilton Pub. Co. California.
2. D.R. Coates (1981) Environmental Geology – John Wiley and Sons – New York.

3. L.Lindgren (1986) – Environmental Geology – Prentice Hall. New Jersey.

### Reference Books

1. W.C. Walton (1979) – Groundwater Resource Evolution – McGraw Hill.
2. A.D. Howard and I. Ramson (1978) – Geology in Environmental Planning – Mc Graw Hill.
3. S.C. Joshi (1978) – Mining and Environment in India – Himalayan Research group – Nainital

## Third Year – Sixth Semester Core Practical – III

### BGCP03 - Crystallography and Mineralogy

#### Crystallography:

Measurement of interfacial angles by using Contact Goniometer. Stereographic projection exhibiting symmetry elements of Normal classes of six systems. Study of crystal models: Determination of System, class on the basis of symmetry elements description of forms and determination of Miller indices of the following crystal models.

Cubic system: Galena, Garnet, Fluorite, Magnetite, Pyrite, Tetrahedrite, Boracite.  
Tetragonal system: Zircon, Apophyllite, Rutile, Vesuvianite, Cassiterite, Octahedrite, Scheelite, Meionite, Chalcopyrite.

Hexagonal System: Beryl Zincite, Apatite, Hematite, Calcite Corundum, Tourmaline, Phenacite, Alpha quartz. Orthorhombic system: Barite, Olivine, Sulphur, Topaz, Staurolite, Calamine and Epsomite.

Monoclinic System: Gypsum, Augite, Orthoclase, Epidote, and Hornblende. Triclinic System: Axinite, Albite, Anorthite, Kyanite, Rhodonite.

Study of Twin crystal models of the following minerals: cubic: Spinel, iron cross twin – Tetragonal: Rutile, Zircon, Cassiterite. Hexagonal: Brazil law – Calcite, Quartz – Orthorhombic: Cruciform. Aragonite – Staurolite – Monoclinic: Mica. Orthoclase: - Carlsbad, Manebach and Baveno, Gypsum – Triclinic: Albite – Simple twin

#### Mineralogy:

Megascopic Identification of rock-forming silicates on the basis of their physical properties; chemical composition and determination of system of crystallization of the following groups of minerals

**Quartz Group:** Rock crystal, Blue Quartz, Rose Quartz, Grey Quartz, Amethyst, Chalcedony, Opal, Agate, Flint, Jasper.

**Feldspar Group:** Orthoclase, Microcline, Perthite, Sanidine, Albite, Oligoclase, Labradorite, and Anorthite.

**Feldspathoid Group:** Nepheline, Sodalite, Lazurite, Lapis lazuli.

**Pyroxene Group:** Enstatite, Bronzite, Hypersthene, Augite, Diopside, Rhodonite, Wollastonite.

**Amphibole Group:** Anthophyllite, Actinolite, Tremolite, Hornblende, Glaucofane.

**Mica Group:** Muscovite, Biotite, Phlogopite, Lepidolite, and Vermiculite.

**Other Silicates :** Olivine, Chlorite, Epidote, Garnet, Apophyllite, Natrolite, Stilbite, Talc, Steatite, Beryl, Kaolin, Cordierite, Apatite, Andalusite, Sillimanite, Kyanite, Staurolite, Tourmaline, Topaz, Calcite, Dolomite, Fluorspar, Zircon.

**Microscopic Identification of rock-forming silicates on the basis of their optical properties.**

**Quartz:** Varieties of Quartz

**Feldspars:** Orthoclase, Albite, Oligoclase, Andesine, Labradorite, and Anorthite.

**Feldspathoids:** Nepheline, Leucite, Sodalite, Nosean and Hauyne

**Pyroxenes:** Hypersthene, Augite, Aegerine, and Diopside.

**Amphiboles:** Tremolite, Actinolite, Hornblende, and Glaucofane.

**Micas:** Muscovite, Biotite, Phlogopite and Vermiculite.

**Miscellaneous Minerals:** Olivine, Serpentine, Chlorite, Epidote, Garnet, Apatite, Zircon, Spinel, Magnetite, Tourmaline, Calcite, Dolomite, Andalusite, Staurolite, Sillimanite and Cordierite.

## **Core Practical – IV**

### **BGCP04 – Economic Geology and Petrology**

**Economic Geology:** Megascopic identification of Industrial & Ore minerals:

Industrial Minerals: Magnesite, Haematite, Siderite, Pyrite, Pyrolusite, Psilomelane, Chalcopyrite, Malachite, Azurite, Galena, Sphalerite, Bauxite, Chromite, Rutile, Zircon & Monazite.

**Petrology:** Megascopic identification of the following rock specimens.

Igneous rocks: Granite, Graphitic granite, Aragonite, Schist rock, Syenite, Rhyolite, Diorite, Gabbro, Dolerite, Basalt, Anorthosite, Dunite, Pyroxenite, Carbonatite.

Sedimentary rocks: Conglomerate, Breccia, Sandstone, Arkose, Shale, Limestone, Flint, Chert, Lignite, Coal.

Metamorphic rocks: Slate, Phyllite, Schist, Gneiss, Quartzite, Marble, Amphibolite, Charnockite, Leptynite, Khondalite & Pyroxene granulite

## **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 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. Visit to Mines and collection of minerals and rocks. Duration of visit is 15 days.

## **LIST OF SKILL BASED ELECTIVE COURSES**

### **BGE01 - Field Hydrogeology and Techniques**

#### **Unit -I**

Importance of Hydrology – Difference between Hydrogeology and Hydrology, Water bearing geologic formations. Ground water provinces of Tamil Nadu. Collection of rain fall data. Short account on Thiessen Polygon isohyetal maps.

#### **Unit -II**

Hydrogeologic parameters: Calculation of Porosity and Permeability, Pump test data, calculation of ground water fluctuations.

#### **Unit - III**

Wells – Well inventory survey: water level, water level fluctuation, subsurface layers (Soil thickness, weathered zone, Fractured zone, Bed rock) - Well construction - Well logging - Sedimentary aquifers: Sandstone, limestone.

#### **Unit – IV**

Hard rock aquifers: charnockites, Gneiss, Granite formation - Field observation and measurement of soil moisture zone, zone of aeration, zone of saturation.

#### **Unit – V**

Pumping Test: Yield, drawdown, recuperation, Transmissivity, Permeability. Case studies: Rainfall in Salem district, Groundwater condition in Salem district. Rain Water Harvesting.

### **TEXT BOOKS:**

1. A Text book of Groundwater – 2000 – P.Arul, Dhanam Agency, 99D, Bazaar Street, Virudachalam – 606 001.
2. Groundwater Hydrology – 1959 – David K. Todd – John Willey & Sons, New York.
3. Ragunath. H.M. 1987, Groundwater, Wiley Eastern Ltd., New Delhi.

## **BGE02 – Geostatistics and Computer Applications**

### **Unit – I**

Geoscience systems and Statistics: Numerical data in Geoscience. Frequency distribution: mean median, mode, dispersion and Measures of central tendency: Merits and Demerits: Measures of Dispersion Skewness and kurtosis, addition, multiplication and division.

### **Unit – II**

Sampling and Sampling plan in Geoscience: Theoretical basis and sampling: Sample Random Sampling Systematic and stratified and cluster sampling: Standard errors. Null hypothesis. Correlation and Regression Analysis in Geoscience

### **Unit – III**

Introduction to Computer – Elements of Computer: Hardware and Software.

Hardware: Input devices: Keyboard, Mouse – Output devices: Monitor, Printer – Memory – Primary: - RA, RAM and Secondary Memory: Hard Disk, Floppy & CD.

### **Unit – IV**

A short account on: Algorithm – Flowcharts, Programming languages – Operating Systems – DOS – Windows – DBMS. Computer applications in Geology : Flowcharts for simple programmes – Geological aspects in windows.

### **Unit – V**

Introduction to GIS softwares in GIS, Utility of computer software in geological studies – Bar diagram, pie diagram, role diagrams, scatter diagram, X-Y plots.

### **Text Books**

1. Balagurusamy, Introduction to Computers
2. Saroj .K. Pal (1985) – Statistics for Geoscientists: Techniques and applications, concept publishing Co., New Delhi.
3. C. Davis, (1975), Statistics and data analysis in Geology, John Wiley & Sons.
4. Gupta G.V., (1995) Basic Statistics, Chand.
5. Ravichandran, D., (2001) Introduction to Computers and communication, Tata McGraw Hill Publication Ltd.,

### **Reference Books**

1. D.F. Merriam (1989), Edited Statistical Analysis : A Computer Oriented Approach, Computer Application in the Earth Sciences, A.A. Affi. an international Symposium Pienum Press, New York.
2. Robert L. Miller (1982), Statistical analysis in the Geological Sciences, John Wiley and Sons, New York.
3. Palk S.K. (1998) Statistics for Geoscientist Techniques and Applications.
4. Gregory, S (1963) Statistical Methods and the geographer Long man & London.

## **BGE03 -Gemology and Gemstone Evaluation**

### **Unit – I**

Definition and scope of gemology – minerals as gemstones – classification of gemstones – characteristic and desirable features of gemstones. Basic physical and optical properties of gemstones – optical classification of gemstones.

### **Unit – II**

Gem testing: Introduction to gem mineral equipment and instruments: polarizer – refractometer – pycnometer – use of heavy liquids. Non destructive methods in gem identification. Gem simulants and proxies. Artificial gemstones and substitutes.

### **Unit – III**

Gemstone cutting: Cutting Instruments: Diamond saw – blade. Preliminary observations – rough cutting of gemstones – sizing and shaping of raw stones – styles of cutting: rounding, cabochon, flat, square, rectangle, crown, brilliant, and laser sculpting.

### **Unit – IV**

Weight standard schemes used in gemology – 4Cs scheme for diamonds. Polishing of gemstones – polishing angles and limits. Polishing equipment and instruments. Feasibility and economics of gem industries in India with special reference to Tamil Nadu. Grading, valuation and pricing of gems.

### **Unit – V**

Gemstone prospecting: Host rocks – gemstone mineralization – deposits. Exploration techniques and exploitation. Gemstone occurrences in India and with special references to Tamil Nadu.

### **Referance & Text Book**

- Karanh R.V.(2000),Gem and gemindustry in India,Memoir 45,Geological Society of India,Bangalore.
- Anderson,B.W(1990).Gem testing (10<sup>th</sup> edition),Butterworth Scentitic,London.
- Babu,T.M.(1998) Dimands in India.Geological society of India, Bangalore.
- Hall,C.(1994).Gemstone,Dorling Kindsley,London.
- Deer,W.A., Houe,R.A abd zussman.S.(1992).An introduction to rock forming minerals,ELBS,London.
- Kerr, P.F.(1997).Optical mineralogy,4<sup>th</sup> Ed.McGrow Hill Book & Co New York.

## **BGE04 - BASICS OF PHOTOGRAMMETRY**

## **Unit – I**

Definition and Principles of Photogrammetry. Developments in Aerial Photography. Scope of Photogeology. Aerial Photography: Types of Aerial Photographs, Scales of aerial Photographs.

## **Unit – II**

Types of Mosaics: Controlled and Uncontrolled mosaic. Field Procedures, Photo Interpretation elements. Aerial Camera and lens. Photographic prints. Types of films, filters - Processing of film negatives.

## **Unit – III**

Stereoscopy and Stereovision. Geometric characteristics of Aerial photographs (Terms, symbols, definitions), Relief displacement, tilt, optical distortion, paper and film - distortion, Parallax bar.

## **Unit – IV**

Photographic instrumentation; Introduction, Pocket stereoscope, mirror stereoscope, sketch master, Radial line plotter - Vertical Exaggeration; factors affecting Vertical Exaggeration, Determination of Vertical Exaggeration.

## **Unit – V**

Applications of Aerial Photography in Mineral, Ground Water and Oil Exploration.

### **Reference:**

1. Principles and Applications of Photogeology, Shiv. N. Pandey, (1987), New age International Private Limited, Publishers – New Delhi – 110 002.
2. Lille Sand and Keifer 2008 – Remote sensing & Image interpretation, John Wiley and Sons.
3. Miller 1975 Photogeology McGraw Hill
4. Pandey S.N. 1996. Principles of Applications of Photo Geology, Wiley Eastern Ltd., New Delhi.

## **BGE05 - Granite Exploration and Exploitation**

### **UNIT-I**

Building Stones. Basic properties of building and dimensional stones. Types of Granites and their commercial terminologies. Granite rock exploration.

## **UNIT-II**

Mining methods of Granites - Marking methods. Methods of cutting and polishing of Granites.

## **UNIT III**

Methods of explorations: Geological and Geophysical methods. Important rocks of Granite Industries – Granites and Marbles.

## **UNIT IV**

Machineries used in Granite Industries – Wire saw machine, Cutting and Polishing Machines.

## **UNIT-V**

Marketing, pricing and Export of Granites. Granites and granite industries of India and Tamilnadu. End uses of Granite wastes.

### **Reference:**

1. Courses in Mining geology –RPN Arogyasamy- John Wiley Eastern Pub
2. Economic minerals –U.Prasad-CBS
3. An introduction to Mineral Economics-KK Chattejee-John Wiley Eastern Pub
4. Mineral Economics-RK Sinha & NL Sharma-Oxford & IBH
5. Field Geology-Mathur

## **BGE06 - Mines and Minerals Legislation of India**

### **Unit – I**

Introduction to Mineral Economics; Essential critical and strategies minerals Demand and Supply National Mineral Policy – Problems and Prospects – Industrial policy Resolutions, 1956 – Schedule – A, Schedule – B, Energy policy, Forest policy.

### **Unit – II**

Essential - Strategic and Critical minerals – Minor minerals – Major minerals. Evolution of National Mineral policy – Ideal Scope of a mineral policy – Categories of minerals for grant of concessions.

### **Unit – III**



Procedure for obtaining mineral concession – Termination, surrender and Determination of mining lease – The oil fields (Regulation & Development ) Act, 1948 – The mines & minerals (Regulation &Development) Act, 1957.

#### **Unit – IV**

Mineral concession Rules, 1960 – The mining leases (Modification of terms) Rules, 1956 – Minerals conservation and development Rules, 1958. The Coal mines Act, 1974 - Coal mines Regulation, 1957.

#### **Unit – V**

The Atomic energy Act, 1957 – The Atomic energy Act, 1962 – The mines Act, 1952 – Mines Rules, 1955 — Metaliferous mines regulation, 1961 – Mineral Taxation and Incentive measures – Incidence of Taxes – Incentive measures – Depletion Allowance – Simplification of Taxation laws.

#### **Reference Books**

1. An Introduction to Mineral Economics – K.K. Chatterjee.
2. Mineral Economics - R.K. Sinha & N.L. Sharma.
3. Industrial Minerals and Rocks of India (1980) – S. Deb. Allied Publishers

### **BGE07 - Introduction to Geoinstrumentation**

#### **Unit – I**

Basic equipments: Description, handling and applications of the following equipments: Hammers, Chisels, Hand lenses, Clinometer, Bruton Compass, Jacob's staff, Pedometer.

#### **Unit – II**

Survey equipments: Chain survey, Plane table, Prismatic Compass, Theodolite, GPS. Field photographic Techniques, Spot analysis Kit for water and soil test.

#### **Unit – III**

Geophysical Survey Equipment: Gravimeters, Magnetometers, Resistivity survey equipments, seismic survey equipments, scintillation counter, Well logging instruments.

#### **Unit – IV**

Pocket stereoscope, Mirror Stereoscope, Stereometer, Pantograph, Rotometer, Plotting equipments. Petrological microscope, Ore microscope, Photomicrograph equipment, Stereomicroscope.

### **Unit –V**

Geochemical Equipment: pH & Eh meters, Potentiometers, TDS determination, Chromatographic Techniques, AA Spectrometer, ICP – MS, XRF – XRD,

### **Reference Books**

Field Geology	-	S.M. Mathur,
Field Geology	-	GoKhale
Field Geology	-	F. Lahee
Field Geology	-	R. Compton
Surveying	-	Punmia
Geophysics	-	Telford
Geophysics	-	Ramachandra Rao
Mineralogy	-	Dennan

Text Book of Surveying - S.K. Husain and M.S. Nagaraj

## **BGE08 - Water Quality Analysis**

### **Unit – I**

Physical properties of water: Colour, odour, taste, temperature, turbidity & viscosity. Methods of analysis of physical properties. World Health Organisation (WHO) and Bureau of Indian Standards (BIS).

### **Unit – II**

Chemical properties of water: pH-alkalinity, acidity and their measurements, ionization potential, gas solubility, precipitation and dissolution of ions, equivalent weight and its measurement, colloids and coagulation, insoluble components and their measurements.

### **Unit – III**

Laboratory methods of Analysis: Standard solutions – determination of pH – Hardness – Dissolved Oxygen – BOD – COD, TDS-TSS. Determination of F,Cl, N, P, K, Na Ca, Mg, Fe, CaCO<sub>3</sub>, HCO<sub>3</sub> & Trace metals.

### **Unit – IV**

Utility of Standards required for Potable, Agricultural and Industrial Purposes. Tools used for assessing the quality of water.

### **Unit – V**

Water Pollution: Urban, Industrial pollution and remedial measures. Arsenic and Fluoride content in water. Recycling of water, Water borne diseases, Reverse Osmosis (RO) system and Desalination of water.

### **References**

1. Davis, N.S., DeWiest, R.J.M. (1996) Hydrogeology, John Wiley, New York.
2. Todd, D.K., (2002) Ground Water 3<sup>rd</sup> edition, John Wiley, Singapore.
3. Freeze, R.A., Cherry, J.A. (1979) Ground Water, Prentice Hall, New Jersey.
4. Sawyer, C.N., McCarty, P.L.(1878) Chemistry for Sanitary Engineers, 3<sup>rd</sup> edition, McGraw Hill, New York.
5. APHA, (1980) Standard Methods for the Examination of Water and Waste Water, 15<sup>th</sup> edition, American Water Works Association and Water Pollution Control Federation, New York.

## **BGE09 - Mapping Techniques in Geology**

### **Unit – I**

Definition and scope of mapping in Geology. Geologic Field Notes: Field Equipments: Clinometer and Brunton Compass - Geological hammer - pocket lens – streak plate – hand magnet – measuring tape.

### **Unit – II**

Field observations – Measuring attitudes of structural features: dip and strike of beds - fold, fault, unconformity, foliation – lineation – joints.

### **Unit – III**

Topographic maps:-definition of topography- parts of topographic map – features represented, map enlargement, reduction and preparation of base map – height / elevation datum in topographic maps.

### **Unit – IV**

Introduction to scale in topographic maps – aerial photographs. Global Positioning System (GPS) - Estimating location and relative height. Preparation of Geological maps and its interpretation.

### **Unit – V**

Sampling and Collection – minerals, rocks, fossils. Geological Report – cross section – order of superposition.

### **Reference**

1. Compton, R.R (1962). Manual of Field Geology, Wiley, new York
2. Mathur, S.M (2001). Guides to Field Geology, Prentice Hall of India, Delhi.
3. Freeman, T.(1999).Procedures in Field geology, Blackwell science Oxford,U.K.
4. Dutro,T.J(1989).AGI data sheet, American Geological institute, Alexandria Virginia U.S.
5. Lahee, F.H(1961).Field Geology, CBS, Delhi.
6. Davis,G.H (1985).Structural Geology of rocks and regions, Wiley,New York.
7. McClay,(1995).Mapping of Geological Structures. Geological Soc. Publication House Barth, U.K.

## **BGE10 - Geology for Competitive Examinations**

### **Unit – I**

Types of competitive examinations: State and Central competitive examinations – TNPSC, UPSC (Civil Services, GSI, IFS), UGC-CSIR, ONGC, AMD, Coal India Ltd etc.

### **Unit – II**

Awareness of syllabus prescribed for various competitive examinations. Objective and descriptive type of questions. Preparation strategies - Collection of previous question papers - Internet and library search for information.

### **Unit – III**

Scope and limits of objective type examinations - Pattern and style of objective type questions - Level of difficulty and standard expected - Long term study and planning. Preparation strategies for short answer and short essay type examination.

### **Unit – IV**

Study methods - objective type - short essay type. Examination techniques: -pre-exam preparation -Writing / choosing questions from simple to complex (or) very known to partly known before answering/ writing answers –Time concept and examination ethics.

### **Unit – V**

Interview - Basic English, Mathematical Ability, Logical Reasoning and Mental Aptitude - Group Discussion, Technical Interview and Management round. Dress code and Physical Fitness.

### **References**

1. Julka and Ravi Misra (2003). Geoinforma – for the cause of promoting Geoscience. Technology Publications, Dehradun.
2. Maddox, H. (1985). How to study, Rupa publications, Delhi
3. Barrass, R, C 2001, Study, Routledge study guides, Chapman & Hall,
4. Srivastava, A.P. (1994), Scoring high in examinations, hearting laboratory publications, Delhi.
5. Barles , Rob, (1992). Successful study for degrees, Routledge, London.
6. Sayeed,A. (2002). Trends in objective Geology, CBS, Delhi
7. Jhulka. A. (1992) Objective Geology, CBCS, Delhi,
8. Bopche, A. (1999). Objective Geology, Dhanpat Rai, Delhi.

## **LIST OF NON MAJOR ELECTIVE COURSES**

## **BGNME01 - Basic Geochemistry**

### **Unit - I**

Origin, abundance and distribution of elements in the universe solar system and earth – composition of crust, mantle, core, hydrosphere and atmosphere.-Geochemical classification of elements.

### **Unit - II**

Basic crystal chemistry:- Minerals as chemical compounds-bonding –ionization potential-electronegativity-periodic table of elements: periodic law and its utility.

### **Unit – III**

Geochemical processes and their geochemical signatures - Processes controlling chemical composition of igneous, metamorphic, and sedimentary rocks.

### **Unit – IV**

Geochemistry of REE, trace elements, stable and radiogenic isotope and their applications.

### **Unit – V**

Geochemistry to mineral exploration:- Elements, dispersion and halos around an ore body-sampling methodology-analytical techniques: AAS-ICP-MS- Gravimetry –chromatography-flame photometry-DTA.

### **Reference:**

1. Krouskoph, K.C. and D.K.Bird (1995) Introduction to Geochemistry, 3<sup>rd</sup> Ed,Wiley,New York.
2. Mason,B.and C.B Moore,(1992),Principles ofGeochemistry,4rd Ed,Wiley,New York.
3. Rollinson,h,(1993), Using Geochemical Data evaluation, presentation and interpretation, Longman,Singapore.
4. Gill,R.C(1997),Chemical fundamentals of Geology,Chapman &Hall,U.K.

## **BGNME02 - Basic Geophysics**

### **Unit – I**

Definition and scope of geophysics. Gross geophysical properties of Earth: Surface gravity variation, electrical and magnetic properties of rock.

### **Unit – II**

Seismic properties of rocks, Densities of various layers of earth (Lithosphere). Distribution of density and pressure within earth.

### **Unit – III**

Heat flow: definition – units – origin – causes. Geotherms: continental and oceanic. Heat flow measurements. Earth's magnetism: definition – parts of earth's magnetic field – variation of earth's field – magnetic properties of rocks and minerals – basic outline of paleomagnetism.

### **Unit – IV**

Geochronology: definition – methods – limitations – radioactivity schemes – Concordia and Discordia ages.

### **Unit – V**

Isostasy: definition – scope – different theories and limitations of Isostasy. Introduction to geophysical tools.

### **References**

1. Lowrie, W.F., (2008) Fundamentals of Geophysics, 2<sup>nd</sup> edition, Cambridge University Press, Cambridge, U.K.
2. Anderson, D.L., (2007) Theory of Earth, 2<sup>nd</sup> edition, Cambridge University Press, Cambridge, U.K.
3. Holmes, A.L. (revised by Duff & Others), (1995) Physical Geology, 5<sup>th</sup> edition ELBS, London.

## **BGNME04 - Geohazards**

### **Unit – I**

Geological Hazards: Introduction to Natural Hazards. Earthquakes: Causes and Measurements – Earthquake Hazards and Risks – Earthquake Prediction and Control – Earthquake Case Histories – Tsunami.

### **Unit – II**

Volcanoes, Magma, and Volcanic Eruptions- Volcanic Landforms, Volcanoes and Plate Tectonics – Volcanic Hazards, Beneficial Aspects, and Predicting Eruptions- Volcanic Case Histories.

### **Unit – III**

Landslides – Mass Wasting and Mass – Wasting Process – Slope Stability, Triggering Events, Mass Wasting Hazards – Subsidence: Dissolution & Human Related Causes

### **Unit – IV**

The Ocean-Atmosphere System – Thunderstorms & Tornadoes – Tropical Cyclones – Hurricane – Tornadoes – Windstorms – Lightning – Drought – Frost and Freezes – Wild Fire

## **Unit – V**

Coastal Zones – Coastal Erosion – River Systems & Causes of Flooding – River Flooding – Flooding Hazards, Prediction and Human Intervention. Extra-terrestrial Hazards. Meteorites & Impacting Events

### **Suggested Books**

1. Montgomery, C.W (2008) Environmental Geology, Mc Graw Hill 8<sup>th</sup> Edition
2. Abbott, Patrick, L(2006) Natural Disasters, Mc Graw Hill, Boston, MA
3. Bryant, E (2005) Natural Hazards, Cambridge University Press, Cambridge, U.K.

## **BGNME05 - Groundwater Management and Rainwater Harvesting**

### **Unit – I**

Groundwater development – dynamic equilibrium in natural aquifers – groundwater budget – management potential of aquifers – safe yield – water law – legal concepts.

### **Unit – II**

Parameters of groundwater balance – conjunctive and consumptive use. Modeling Techniques in groundwater management. Groundwater resources evaluation in India. Estimation of recharge components.

### **Unit – III**

Sampling of Geological material:- Types of geological samples – precaution –collection and marking of samples and their location – storage of samples – outline of methodology - followed in mineral, core, rocks and fossil sampling. Report writing: (purpose and scope) – style – clarity – drawings and diagram – section.

### **Unit- IV**

Groundwater mining and cyclic storage. Rainwater, surface water and groundwater interactions. Problems and remedial methods. Watershed management.

### **Unit – V**

Rain water harvesting: Definition and types – storm water harvesting – rooftop harvesting – ground water recharge - storage tanks – check dams - quality developments. Consumptive and Conjunctive use of water.

### **References**

1. Todd, D.K., (2002) Ground Water, 3<sup>rd</sup> edition, John Wiley, Singapore.
2. Fetter, C.W., (1990) Applied Hydrogeology, 2<sup>nd</sup> edition, CBS, New Delhi.
3. Karanth, K.R. (1980) Ground Water Assessment Development and Management, Tata McGraw Hill, New Delhi.
4. Chaturvedi, M.C., (1987) Water Resources Systems Planning and Management, Tata McGraw Hill, New Delhi.
5. Davis, N.S., DeWiest, R.J.M.(1979) Hydrogeology, John Wiley, New York.
6. Freeze, R.A., Cherry, J.A. (1979) Ground Water, Prentice Hall, New Jersey.

**Common Course Structure under – UG Programmes  
Applied Geology**

Part	Course	Sem – I			Sem – II			Sem – III			Sem – IV			Sem – V			Sem – VI			Total Courses	Total Hours	Total Credits
		No.Of Courses	Hrs./W	Crdts	No.Of Courses	Hrs./W	Crdts	No.Of Courses	Hrs./W	Crdts	No.Of Courses	Hrs./W	Crdts	No.Of Courses	Hrs./W	Crdts	No.Of Courses	Hrs./W	Crdts			
I	Tamil Lang.	1	6	3	1	6	3	1	6	3	1	6	3							4	24	12
II	English Lang.	1	6	3	1	6	3	1	6	3	1	6	3							4	24	12
III	Theory Core	1	4	4	1	4	4	1	4	4	1	4	4	4	20	16	4	20	16	12	48	48
	Practical Core		3		1	3	3		3		1	3	3	1	3	3	1	3	3	4	18	12
	Elective														Project 4		Project 1	4	15	1		15
	Theory Allied	1	4	3	1	4	3	1	4	3	1	4	3							4	16	12
	Practical Allied		3		1	3	4		3		1	3	4							2	12	8
IV	En.Stud.		1		1	1	2													1	2	2
	Val. Edn.		1			1					1		2							1	2	2
	SBEC	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	6	12	12
	NMEC							1	2	2	1	2	2							2	4	4
V	Extn Act.																1		1	1		1
Total		5	30	15	8	30	25	6	30	17	9	30	27	5	30	18	Project 7	30	39	42	180	140

SBEC – Skill Elective Courses

NMEC – Non major Elective Courses