

KANNUR UNIVERSITY

(Abstract)

B.Sc Geology Programme-Scheme & Syllabus of Core/Complementary/Open Courses under Choice Based Credit Semester System for Under Graduate Programme-implemented with effect from 2009 admission-Orders Issued.

ACADEMIC BRANCH

U.O.No.Acad/C2/3999/2007

Dated, K.U.Campus. P.O,08-07-2009.

Read: 1.Minutes of the meeting of the Board of Studies in Geology (Cd) held on 30-05-2009.

2. Minutes of the meeting of the Faculty of Science held on 16-06-2009.

3. U.O No.Acad/C2/3838/2008 (i) dated 07-07-2009.

4. Letter dated 01-07-2009 from the Chairman, BOS in Geology (Cd).

ORDER

1.The Board of Studies in Geology (Cd) vide paper read(1) above has prepared and finalised the Scheme and Syllabus of Geology Core/Complementary/Open Courses and model question papers under Choice Based Credit Semester System for implementation from 2009 admission.

2. The recommendations of the Board in restructuring the syllabus is considered by the Faculty of Science vide paper read (2) and recommended for the approval of the Academic Council.

3. The Regulations for Choice based Credit Semester System is implemented in this University vide paper read (3).

4. The Chairman, BOS in Geology (Cd) vide paper read (4), forwarded the restructured scheme and syllabus of Core/Complementary/Open Courses along with model question papers under Geology Programme prepared in line with Choice Based Credit Semester System, by the Board of Studies in Geology (Cd) for implementation with effect from 2009 admission.

5. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction ***to implement the scheme and syllabus of Core/Complementary/Open Courses along with model question papers under Geology Programme restructured in line with Choice Based Credit Semester System, with effect from 2009 admission,*** subject to ratification by the Academic Council.

6. The restructured scheme and syllabus of Core/Complementary/Open Courses under Geology Programme with model question papers restructured in line with Choice Based Credit Semester System, implemented with effect from 2009 admission is appended.

7. The Scheme and Syllabus of Complementary Courses offered for this Programme will be available along with the syllabus of Core Courses of the Complementary subject.

8. The affiliated Colleges are not permitted to offer Complementary Courses in violation to the provisional/permanent affiliation granted by the University. Changes in Complementary Courses are permitted with prior sanction /revision in the affiliation order already issued in this regard.

9. If there is any inconsistency between the Regulations for CCSS and its application to the Scheme & Syllabus prepared, the former shall prevail.

10. Orders are issued accordingly.

Sd/-

REGISTRAR

To:

1. The Principals of Colleges offering Geology Programme
2. The Examination Branch (through PA to CE)

Copy To:

1. The Chairman, BOS Geology (Cd)
2. PS to VC/PA to PVC/PA to Regr
3. DR/AR I Academic
4. Central Library
5. SF/DF/FC.

Forwarded/By Order

SECTION OFFICER

Appendix to U.O.No Acad/C2/3999/2007 dated 08-07-2009.



KANNUR UNIVERSITY

Course Structure and Syllabus

FOR

UNDERGRADUATE PROGRAMME

IN

G E O L O G Y

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

w.e.f 2009 ADMISSION

About the Course

Definition of Geology:

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them. It includes the study of organisms that have inhabited our planet. Study of rocks , minerals, Groundwater resources , Interior of the earth also form part of it, An important part of geology is the study of how Earth's materials, structures, processes and organisms have changed over time.

What Does a Geologist Do?

Geologists work to understand the history of our planet. The better they can understand Earth's history the better they can foresee how events and processes of the past might influence the future. Here are some examples:

Geologists study earth processes:

Many processes such as landslides, earthquakes, floods and volcanic eruptions can be hazardous to people. Geologists work to understand these processes well enough to avoid building important structures where they might be damaged. If geologists can prepare maps of areas that have flooded in the past they can prepare maps of areas that might be flooded in the future. These maps can be used to guide the development of communities and determine where flood protection or flood insurance is needed.

Geologists study earth materials:

People use earth materials every day. They use oil that is produced from wells, metals that are produced from mines and water that has been drawn from streams or from underground. Geologists conduct studies that locate rocks that contain important metals, plan the mines that produce them and the methods used to remove the metals from the rocks. They do similar work to locate and produce oil, natural gas and ground water.

Geologists study earth history:

Today we are concerned about climate change. Many geologists are working to learn about the past climates of earth and how they have changed across time. This information is valuable to understand how our current climate is changing and what the results might be.

Geology as a Career:

Geology can be a very interesting and rewarding career. The minimum training required is a three year college degree in geology. Pre-college students who are interested in becoming geologists should take a full curriculum of college preparatory courses, especially those in mathematics, science, and writing. Courses related to computers, geography and communication are also valuable.

Geologists work in a variety of settings. These include: natural resource companies, environmental consulting companies, government agencies, non-profit organizations, and universities. Many geologists do field work at least part of the time. Others spend their time in laboratories, classrooms or offices. All geologists prepare reports, do calculations and use computers.

Although a bachelor's degree is required for entry level employment, many geologists earn master's and/or doctorate degrees. The advanced degrees provide a higher level of training, often in a geology specialty area such as paleontology, mineralogy, hydrology or volcanology. In most cases postgraduate degree is essential. Advanced degrees will often qualify the geologist for supervisory positions, research assignments or teaching positions at the university level. These are some of the most sought after jobs in the field of geology.

Employment opportunities for geologists are very good. Most geology graduates with a strong academic background and good grades have no trouble finding employment if they are willing to move to a location where work is available. Employment opportunities are there all over the world. Hundreds of class I posts available in Geological Survey of India, Oil and Natural Gas Commission , Indian Space Research Organization , Centre for Earth Science Studies , Central Ground Water Board ,Various Universities and Colleges as faculty members, Center for Water Resources Development and Management , Science and Technology , National Institute of Hydrology , Remote Sensing Utilisation Centres , Land Management Departments , Logging Engineers and Geophysicists, Groundwater Departments and Mining and Geology Department . Very good opportunities are there in countries like USA , UK, Gulf countries , Vietnam , Australia and Singapore.

Open courses in Geology will be benefited to the general public. The environmental degradation created as a result of the implementation of unscientific developmental activities can be understood if one has a knowledge in the subject.. The extension work in connection with the Peoples Planning programme at Panchayat level can be properly implemented if one has a knowledge about the natural resource.. Various awareness programmes can also be undertaken. The people may become aware about the need to protect the environment, to stop soil erosion and landslide. The need for sustainable development is given due importance in the subject.

Programme outcome

The graduates in Geology are employable as Geological Assistant, Technical Assistant in various Geological Organisations like Mining & Geology and Ground Water Department. With B.Ed they are able to teach courses at school level in Earth and Environment related subjects in Geography and Science.

They can also proceed to Postgraduate courses and Research.

The subject also has a multidisciplinary nature where it can be associated with Botany ,Zoology, Physics, Chemistry, Mathematics ,Geography and Computer Science. Mining and Civil Engineering also show interlink with the subject.

The graduate of this programme should be able to

- 1. Megascopically identify common rocks ,minerals and fossils fro outcrops,exploration pit ,core samples and slurries.*
- 2. Read and interpret geological maps with particular reference to structure and lithology*
- 3. To assist design and develop geological map ,geological cross section and panel diagrams to understand subsurface geology*
- 4. Identify landforms ,soil types and their interrelationships.*
- 5. Identify and assess the impact on environment caused by exploitations of natural resources.*
- 6. Assist in site selections for light civil constructions.*
- 7. Read , interpret and report on topographical maps.*
- 8. To plan and execute geological field work*
- 9. Communicate geological knowledge so as to evolve sustainable living practices.*
- 10.To explain and document causes and effect of common natural hazard impacting the society.*

ADMISSION CRITERIA

Should have passed qualifying examination with Science combination or any other combination with Geology as one of the subject.

COURSE STRUCTURE
BSc.GEOLOGY

Semester	Name of the Course	Hours/ week	Total Hours	Credits
I	Common Course English I	5	90	4
	Common Course English II	4	72	3
	Common Course Additional Language I	4	72	4
	Core Course I	4	72	4
	Complementary I	2	36	2
	Complementary I Practical	2	36	*
	Complementary II	2	36	2
	Complementary II Practical	2	36	*
	Total		25	
II	Common Course English III	5	90	4
	Common Course English IV	4	72	3
	Common Course Additional Language II	4	72	4
	Core Course II	4	72	3
	Complementary I	2	36	2
	Complementary I Practical	2	36	*
	Complementary II	2	36	2
	Complementary II Practical	2	36	*
	Total		25	
III	Common Course English V	5	90	4
	Common Course Additional Language III	5	90	4
	Core Course III	3	54	3
	Core Course IV	2	36	2
	Complementary I	3	54	2
	Complementary I Practical	2	36	*
	Complementary II	3	54	2
	Complementary II Practical	2	36	*
	Total		25	
IV	Common Course English VI	5	90	4
	Common Course Additional Language IV	5	90	4
	Core Course V	3	54	3
	Core Course VI Practical I	2	36	2
	Complementary I	3	54	2
	Complementary I Practical	2	36	4
	Complementary II	3	54	2
	Complementary II Practical	2	36	4
	Total		25	
V	Core Course VII	4	72	2
	Core Course VIII	3	54	2
	Core Course IX	4	72	4
	Core Course X	4	72	4
	Core Course XI	3	54	3

	Open Course	2	36	2
	Core Course Practical	4	72	0
	Core Course Study Tour/Field work/Resource Mapping /Institution visit	1	18	0
	Total	25		17
VI	Core Course XII	3	54	3
	Core Course XIII	3	54	3
	Core Course XIV	4	72	3
	Core Course XV Practical II	4	72	4
	Core Course XVI Practical III	4	72	4
	Core Course XVII Elective	3	54	3
	Core Course XVIII Project /Viva /Mine Visit/ Report/ Sample collection	2	36	2
	Open Course	2	36	2
	Total	25		24
	Grand Total	150		120

Scheme Geology(Core)

Se mes ter	Course Code	Name of the Course	Hour/ week	Total hours	Credits
I	1B01GEO	Introduction to Earth Sciences	4	72	4
II	2B02 GEO	Methodology and Perspectives in Science Stream with special reference to Geological Studies	4	72	3
III	3B03 GEO	Geo informatics	3	54	2
	3B04 GEO	Crystallography	2	36	2
IV	4B05 GEO	Mineralogy	3	54	3
	4B06 GEO	Practical Paper I (Geo informatics, Geomorphology, Crystallography and Mineralogy)	2	36	2
V	5B07 GEO	Igneous Petrology	3	54	2
	5B08 GEO	Metamorphic Petrology	3	54	2
	5B09 GEO	Stratigraphy and Sedimentary Petrology	5	90	4
	5B10 GEO	Structural Geology	5	90	4
	5B11 GEO	Elective : Disaster Management/ Petroleum Geology.	3	54	3
		Practical- Petrology and Structural Geology	2	36	0
		Study tour/Field work/Resource mapping/Institutional visit.	2	36	0
VI	6B12 GEO	Geology of India	3	54	3
	6B13 GEO	Economic Geology	3	54	3
	6B14 GEO	Paleontology	4	72	3
	6B15 GEO	Practical II (Petrology and Economic Geology)	4	72	3
	6B16 GEO	Practical III (Structural Geology and Paleontology)	4	72	3
	6B17 GEO	Elective: Disaster Management/ Petroleum Geology	2	36	2
	6B18 GEO	Project/Viva/Mine visit/ Report/ Sample Collection	3	54	2

Scheme Open Courses

Semester	Course Code	Name of the Course	Hours/Week	Credits
V	5D01GEO	Earth Sciences	2	2
VI	6D01GEO	Gemology and Decorative Stones	2	2
VI	6D02GEO	Environmental Geology	2	2

Scheme Geology(Complementary)

Semester	Course Code	Name of the Course	Hours/Week	Credits
1	1C01GEO	Geology I	2	2
1	1C02GEO	Geology I Practical	2	*
2	2C03GEO	Geology II	2	2
2	2C04GEO	Geology II Practical	2	2
3	3C05GEO	Geology III	2	2
3	3C06GEO	Geology III Practical	2	*
4	4C07GEO	Geology IV	2	2
4	4C08GEO	Geology IV Practical	2	2

Study Tour/Field work/Resource Mapping /
Institution visit/ Project /Viva /Mine Visit/
Report/Sample collection

Study tour forms integral part of the course. Since it is a field oriented course as many number of field visits will help the student to get an exposure in the subject. Observation mind is very important in the case of Geology students. Combined study tour in IV and VI

Semester has to be arranged . One study tour can be restricted to the State and another as far as possible in different areas so that students will get good collection of rocks , minerals and fossils. The college museum can also be enriched. Field work, Resource mapping , Geological Institution visit , Mine visit etc are part of the study tour. The students may be trained to write field reports. Sample collections collectively and individually have to be encouraged. They have to prepare a detailed report on the assignment carried out and submit it for the examination for evaluation. Project means a small Group work as decided by the Departmental Council to generate a research mind in the student. It can be their observation on the geological work of ground water , stream , wind , waves or detailed observation of aQuarry ,landslide area or flood plain or groundwater conservation ,waste management , landuse pattern , Resource mapping of a Panchayath etc.etc as decided by the Departmental Council every year.

Without project and study tour report student should not be allowed to take up the Practical examination. All the male and female students should undergo all these trainings.

Viva should be conducted internally and externally.

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS: 72
CREDITS : 4

1B01GEO- INTRODUCTION TO EARTH SCIENCES

MODULE 1 Earth Sciences-Definitions, brief introduction to the various branches of earth sciences- Physical Geology, Geomorphology, Structural Geology, Mineralogy, Crystallography, Petrology, Geotectonics, Palaeontology, Stratigraphy, Economic Geology, Environmental Geology, Engineering Geology, Mining Geology, Marine Geology, Geochemistry, Geophysics, Geostatistics Geobotany, Geophysics, Geochemistry, Meteorology, Oceanography etc. (4 hrs.)

MODULE II Solar system with special emphasis on terrestrial planets and meteorites. Earth in solar system: size, shape, volume, mass, rotational and revolutional parameters. Modern theories of origin of earth, age of the earth. Geospheres: Atmosphere, hydrosphere and lithosphere. Exogenic and endogenic processes and agents. The concept of rock cycle. Agents, types and products of weathering. Influence of climate and lithology on weathering. Soils- Geological classification of soil, Mass wasting- Types, causes and controls (18 hrs.)

MODULE III Volcanoes: mechanism and causes of volcanic eruption, types products effects and prediction. Global distribution of volcanoes. Earthquakes: types and causes, propagation of seismic waves, focus and epicenter, elastic rebound theory, seismograph and seismogram. Intensity and magnitude of earthquakes, seismic belts of the world. (16hrs)

MODULE IV Streams-Drainage basins and streams, Erosional and depositional landforms. Geomorphic cycle and concept of peneplain, Oceans and Seas: Ocean water-extent, composition, waves, currents, tides, Marine erosion, transportation and deposition. Coastal landforms and ocean floor topography, Oceanic sediments. Coral reefs- origin and distribution. (18 hrs)

MODULE V Glaciers: Formation and morphology, types, erosion and transportation by glaciers, Glacial landforms, Ice age and its causes. Lakes: Origin, classification and geological importance, Backwaters of Kerala. Wind: Cyclone, Anticyclones, Hurricanes, Geological action of wind, landforms of aeolin origin. Ground water: Source, nature, storage, porosity, permeability, aquifer, aquiclude, water table, seepage and springs, geysers, wells, artesian wells, Geological action of groundwater. (16 hrs.)

LIST OF REFERENCES

- 1.**BLOOM .A.L.** (1992): Geomorphology, Second Edition, Prentice Hall India Pvt.Ltd.,New Delhi.
- 2.**HOLMES.A.**(1981): Principles of Physical Geology. ELBS, Third Edition.Thomas Nelson
- 3.**GILLULY,J.,WATERS .A.C. and WOODFORD .A.C.**(1975) Principles of Geology, Fourth Edition, W.H. Freeman and Co.,
- 4.**JUDSON.S & KAUFFMAN.M.E**(1990)Physical Geology Eighth Edition,Prentie Hall,New Jersey.
- 5.**MCALISTER,A.L.and HAY, E.A.**(1975)Physical Geology, Principles and Perspectives. Prentice Hall Inc. London.
- 6.**MATHUR**, Physical Geography. National Book Trust, New Delhi.
- 7.**MISHRA**, Rivers of India. National Book Trust, New Delhi.
- 8.**MONTGOMERY C.W.**(1993) Physical Geology. Wn. C.Brown Publishers, IOWA.
- 9.**SKINNER. B.J. and PORTER S.C.**(1987).Physical Geology, John Wiley and Sons, New York.
- 10.**STRAHLER, A.N.**(1971)Earth Sciences, Second Edition, Harper and Row.
- 11.**AHAMED .E.**(1972) Coastal Geomorphology of India. Orient LONGMAN, New Delhi
- 12.**KING.C.A.M.**(1972) Beaches and Coasts. Arnold, London,..
- 13.**THORNBURY W.D** (1968)Principles of Geomorphology, Wiley

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS: 72
CREDITS : 3

2B02GEO-METHODOLOGY AND PERSPECTIVES IN SCIENCE STREAM WITH SPECIAL REFERENCE TO GEOLOGICAL STUDIES

MODULE 1 –Science and Science Studies- Types of knowledge-Practical, Theoretical and Scientific knowledge.What is Science and what is non Science?Basis for Scientific laws and factual truths.Science as a human activity. Empirism,creative imagination and logic Vocabulary of Science and Disciplines of Sciences. (10 hrs)

MODULE -II Methods and tools of Science – Hypotheses , theories and laws in Science. Observations , evidences and proofs . Formulation of hypothesis- Inductive and deductive methods . Significance of verification ,corroboration and falsification- Proving and disproving . Posing a question . Revision of Scientific theories and laws . Importance of models, simulations and virtual testing. Mathematical methods virsus Scientific methods . Significance of peer review . (12 Hrs)

MODULE –III -Experimentation in Science - Design and planning of experiments Experimentation and observation – Selection of controls , observational and instrumental requirements. Data collection and documentation of experiments. Record keeping . Repeatability and replication of experiments. Errors in experimentation and observation. Human and machine. Scientific instruments – Sensing extension. Choice. Sensitivity and Precision of instruments. (15 hrs)

MODULE -IV Data handling and Ethics –Collection ,storage and treatment of data. Data interpretation and deduction. Significance of statistical tools in data interpretation .Errors in data interpretation.Graphs ,Tables, Histograms and Pie diagrams . Deduction of Scientific Correlation . Patterns and trends Ethics in Science. Sources of data.-Primary ,Secondary and Digital.Sharing of knowledge.-transparency and honesty. Danger of preconceived ideas. Human bias in observation ,data handling andreporting. Using and acknowledging data and interpretation of others. Publications and patents. Plagiarism. (15 hrs)

MODULE -V Methodology in Geological Studies - Concept of time in Geology- Principle of Uniformitarianism .Geological processes and products.Importance of observation in Geology. Documentation and interpretation. Theories of neptunism,, plutonism and catastrophism. Importance of the theory of evolution . Theory of Plate Tectonics. Instrumental methods in Geology-Field instruments- Hammer, chisel, haversack lens,magnet,Clinometer , Brunton Compass . Laboratory instruments and methods- Polarising microscopes,study of rocks and minerals in thin section . Mineral grain mount. Sieving of sediments and heavy mineral separation. Aerial photographs ,satellite imageries , Geological maps . Importance of field work in Geology. Field methods. Location of a point using compass and topographic map. Sample collection –rocks,minerals,fossils,soil and sediments. Field observations and field note book. (20 hrs)

LIST OF REFERENCES

- 1.LAHEE,(1987)Field Geology.Sixth Edition. Mc Graw Hall Co.
- 2.WILLIAMS, H., TURNER, J.F. and GILBERT,C.M.(1985) Petrography-An Introduction to the study of rocks in thin Sections, Second Edn. CBS Publishers, Delhi.
- 3.MOOREHOUSE,W.W.(1959)The study of rocks in thin sections. Harper and Row, New York.
- 4.JOHANSSON(1952), Manual of Petrographic Methods, McGraw Hill .1952.
- 5.LOW G. W. Geological field methods. Harper and Brothers.
- 6.HUCHISON.H.C (1974)Laboratory Hand Book of Petrographic techniques-john Wiley and sons
- 7.DICKINSON G.C,(1979.) Maps and Air photographs. Edward Arnold
- 8.JEFFREY A.LEE (2009) The Scientific Endeavor –Methodology and Perspectives of Sciences Pearson

HOURS PER WEEK : 3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 54
CREDITS : 3

3B03GEO -GEOINFORMATICS

MODULE I – Modern Personal Computer – Specifications – RAM, CPU and clock speed, Hard disk capacities, network card and data transfer rates, mother boards, Newer multimedia devices – Pen drives, ipods, mobile phones, RFID devices, playstations, external hard disk, zip drives, DVD drives. Laptop-Palm top. (6 hrs)

MODULE II – Different operating systems – Windows: NT, XP and Vista – Linux: Ubuntu, Fedora etc. Office packages, Internet browsers. Wikipedia, Scribd, podcasts, bit torrents etc as learning tools. Plagiarism – what constitutes it. E-governance initiatives of Govt of Kerala. (4 hrs)

MODULE III – Introduction to GPS. Basic idea of GPS. GPS satellites. Control centres. Types of GPS receivers. Uses of GPS. Worldwide digital network GPS. (5 hrs)

MODULE IV – Types and nature of spatial data in geology and hydrogeology. Introduction to GIS. History of the development of GIS. GIS related softwares, Map info-Vertical mapaThe structure of GIS. Data representation in GIS – points, lines, polygons. Popular GIS initiatives: Google maps, Google earth. (14 hrs)

MODULE V – Data entry into GIS. GIS vector data. GIS raster data. GIS layers. Data , extraction from GIS by simple querying. Basic map generation. Introduction to GIS packages: Free GIS – GRASS and gvSIG. Commercial GIS – ArcGIS. Case studies in ground water table, geological mapping, contour map either water level contour map or surface contour map. Applications of GIS in water quality, land use and soil pollution etc.Creation of buffer. (25 hrs)

LIST OF REFERENCES

- 1.STEPHEN WISE** (2002)GIS Basics CRC Press
- 2.AHMED EL-RABBANY**(2002)Introduction to GPS: The Global Positioning System Artech House, Boston, 194p
- 3.PAUL V. BOLSTAD** (2005) GIS Fundamentals: A First Text on Geographic Information Systems. Eider Press
- 4.TASHA WADE, SHELLY SOMMER** (2006)A to Z GIS: An Illustrated Dictionary of Geographic Information Systems ESRI Press, 268p
- 5.KEITH C. CLARKE** (2007) Getting Started With GIS Prentice Hall 432p
www.maps.google.com
<http://www.esri.com/software/index.html>

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

3B04GEO- CRYSTALLOGRAPHY

MODULE-I Elements of crystallography: crystalline state and crystals, Morphology of crystals, faces, edges, vertex, forms and zones. Crystal angles-plane angles, interfacial angles and solid angles. Contact Goniometer, law of constancy of interfacial angles. External symmetry. (5 Hrs)

MODULE II Crystallographic axes: choice of axes, labelling and orientation, classification of crystals in to Systems and Classes, nomenclature of crystal faces, intercepts, parameters, unit face, Weiss notation, Miller indices, law of crystal indices, axial ratio. Brief study of the following: holohedral, hemihedral, hemimorphic, enantiomorphic and tetartohedral forms. (6 hrs)

MODULE III Systematic crystallography: The study of symmetry, simple forms and combinations of the following crystal classes. Isometric systems-normal, tetrahedral, pyritohedral and plagiohedral. Tetragonal system- Normal, tripyramidal and sphenoidal class. (10hrs)

MODULE IV Hexagonal system: Hexagonal Division- Normal class, tripyramidal, trapezohedral. Rhombohedral Division- Rhombohedral, trirhombohedral, pyramidal hemimorphic trapezohedral. Orthorhombic system-Normal class. monoclinic system-Normal class. Triclinic system-Normal class. (10hrs)

MODULE V Twin crystals: elements of twinning, twin axis, twin plane, compositional plane, important examples of twinning. Brief study of morphological imperfections in crystals. Stereographic projection - basic concept and projection of isometric system normal class(form and symmetry). (5 Hrs)

LIST OF REFERENCES

- 1.Dana, F.S.** (1955) – A text book of mineralogy – Asia publishing House, Wiley.
- 2.Phillips .P.C** (1956) - An Introduction to crystallography-Longmans Green

HOURS PER WEEK : 3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS: 54
CREDITS : 3

4B05GEO- MINERALOGY

MODULE I Mineral: Definition of Mineral and Mineraloid – Scope and aim of Mineralogy. Physical mineralogy-Physical properties of minerals-form, habit, cleavage, fracture, colour, luster, streak, hardness, specific gravity, piezo electricity and pyro electricity. (10 hrs)

MODULE -II Chemical mineralogy: Chemical elements and periodic Table - Bonding of atoms – Metallic, Co- valent, Ionic and Van der Waals Bonding in Minerals, Solid solution, exsolution, Isomorphism, Polymorphism and Pseudomorphism in minerals. (5 hrs)

MODULE III Optical mineralogy: Ordinary and polarized light, polarization of light, Refractive index, critical angle and total internal reflection. Polarization by reflection, absorption, refraction, double refraction, construction of Nicol prisms. Petrological microscope parts and functions. Optical accessories-mica plate, gypsum plate and quartz wedge. Birefringence, isotropic and anisotropic substances, uniaxial and biaxial minerals, optic sign, relief, Pleochroism, pleochroic haloes, alteration, zoning. (15 hrs)

MODULE IV Descriptive Mineralogy. a) classification of minerals. b) Systematic study of the important non silicate minerals-Diamond, Graphite, Sulphur, Gold, Silver, Copper, Realgar, Orpiment, Stibnite, Molybdenite, Cinnabar, Sphalerite, Galena, Chalcocite, Bornite, Chalcopyrite, Pyrite, Magnetite, Hematite, Marcassite, Barite, Gypsum, Halite, Fluorite, Corundum, Cryolite, Cuprite, Spinel, Chromite, Rutile, Cassiterite, Ilmenite, Monazite, Psilomelane, Pyrolusite, Goethite, Limonite, Bauxite, Calcite, Dolomite, Aragonite, Magnesite, Siderite, Malachite, Azurite. (12 hrs)

MODULE V Structure and classification of silicate minerals with detailed physical, chemical and optical properties of the following. Olivine family, Garnet family, Alumino silicate family, Epidote family, Pyroxene family, Amphibole family. Beryl, Cordierite, Tourmaline, Clay minerals and Mica family. Feldspars, Feldspathoids, Quartz and Zeolite group. (12 hrs)

LIST OF REFERENCES

- 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.DEER. W.A.,HOWOE. R.A AND ZUESSMAN, J.** (-1966) .An introduction of the Rock forming minerals. Longmans.
- 5.BERRY , MASON, DIETRICH,**(2000)- Mineralogy, CBS Publication
- 6.CORNELIS KLEN AND CORNELIUS S. HURLBUT** (1985) – Manual of Mineralogy, John wiley & Sons

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

4B06GEO PRACTICAL-I-GEOINFORMATICS,
GEOMORPHOLOGY, CRYSTALLOGRAPHY AND MINERALOGY

Practicals in Geoinformatics

Introduction to the parts of a computer -Internet basics and wikipedia
Visit to a GIS lab-Basic operations of the GPS.
Demonstration of any GIS package-Entering data into a GIS
Generating a simple map with the GIS

Practicals in Geomorphology

Description of features in Survey of India's Toposheet, Study of marginal information, Interpretation of intramarginal and extra marginal information.
Study of geological conventional signs, symbols, physical and socio-cultural features.
Visual observation, tracing and interpretation of features in satellite imagery.
Stereographic visualisation of aerial photos.
Instructional training on uses of Clinometer, Brunton compass and GPS.
Field trip to understand the geomorphology and topography of a nearby locality.
Report preparation on field trip.

Practicals in Crystallography

Drawing of symmetry elements of Normal classes of all systems.
Identification and description of the following crystal models.
Isometric system: Galena, Garnet, Spinel, Magnetite, Fluorite, Sphalerite, Tetrahedrite, Pyrite and Cuprite.
Tetragonal system: Zircon, Cassiterite, Rutile, Apophyllite, Chalcopyrite.
Hexagonal system: Beryl, Beta Quartz, Calcite, Tourmaline, Alpha Quartz.
Orthorhombic System: Barite, Olivine, Topaz, Sulphur, Staurolite.
Monoclinic system: Gypsum, Orthoclase, Augite, Hornblende.
Triclinic: Axinite, Albite, Kyanite.
Twin crystals: Spinel, Fluorite, Rutile, Calcite, Quartz, Staurolite, Aragonite, Gypsum, Augite, Orthoclase, Albite.

Practicals in Mineralogy

Megascopic study and identification of the following minerals:

Quartz, Smoky Quartz, Milky Quartz, Rosy Quartz, Amethyst, Chalcedony, Agate, Flint, Jasper, Chert, Opal, Orthoclase, Microcline, Plagioclase, Perthite, Nephelene, Leucite, Sodalite, Enstatite, Bronzite, Hypersthene, Diopside, Augite, Spodumene, Acmite, Rhodonite, Wollastonite, Anthophyllite, Tremolite, Actinolite, Hornblende, Olivine, Serpentine, Muscovite, Biotite, Vermiculite, Phlogopite, Chlorite, Epidote, Garnet, Natrolite, Stilbite, Apophyllite, Talc, Steatite, Andalusite, Kyanite, Sillimanite, Staurolite, Cordierite, Apatite, Beryl, Topaz, Calcite, Dolomite, Tourmaline, Zircon, Fluorite.

Microscopic study of the following minerals:

Quartz, Microcline, Orthoclase, Albite, Oligoclase, Labradorite, Nephelene, Leucite, Enstatite, Hypersthene, Augite, Diopside, Hornblende, Tremolite, Actinolite, Anthophyllite, Biotite, Muscovite, Olivine, Epidote, Garnet, Chlorite, Cordierite, Andalusite, Sillimanite, Kyanite, Staurolite, Calcite, Sphene, Apatite, Zircon.

HOURS PER WEEK : 3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 54
CREDITS : 2

5B07GEO - IGNEOUS PETROLOGY

MODULE I- Rock-definition, types, rock cycle, Plutonic, hypabyssal and volcanic igneous rocks. Forms of igneous rocks: lava flows, pyroclastic deposits, volcanic ash, sill, lacolith, lopolith, phacolith, dyke, cone sheets, batholiths, stocks, bosses, bysmalith, ring dykes and dyke swarms. Structures of igneous rocks: Definition, vesicular, amygdaloidal, blocky lava, rhyolite lava, pillow structure, flow structure, sheeted joints, mural jointing, columnar jointing, rift and grain. (12 HOURS)

MODULE II Textures of igneous rocks: definition, crystal and glass, crystallites and minerals. Granularity and shapes of crystals, equigranular textures-allotriomorphic, hypidiomorphic, panidiomorphic. Inequigranular textures-porphyritic and poikilitic, intergrowth textures, directive textures, devitrification, perilitic fractures, spherulitic structures, reaction structure (8 HOURS)

MODULE III Cooling history of igneous rocks, melting and crystallization. Bowen's Reaction Series. A study of the following Binary systems, Diopside-Anorthite (Eutectic), Albite-anorthite (solid solution), Forsterite-silica (Incongruent). Partial melting and formation of magma, magma generation. Petrotectonic settings; mid oceanic ridges and subduction zones, (9 HOURS)

MODULE IV Diversity of igneous rocks-magmatic differentiation, fractional crystallization, liquid immiscibility, assimilation. Classification and nomenclature of igneous rocks based on depth of occurrence, silica percentage, colour index. Tyrrell's tabular classification, CIPW norm, IUGS-QAPF classification of plutonic and volcanic rock. (10 HOURS)

MODULE V. Petrography and petrogenesis and association of the following rocks/classes. Granite, Pegmatite, aplite, syenite, diorite, gabbro, basalt, dolerite, dunite, peridotite. (15 HOURS)

LIST OF REFERENCES

1. **TYRRELL, G.W.** (1978) The principles of petrology – Chapman and Hall Ltd. London.
2. **BOWEN, N.L.M** The Evolution of the Igneous Rocks – Dover publication, Inc, New York
3. **BARTH, F.W.** (1962) Theoretical Petrology - Wiley.
4. **WALSTROM, E.E.** (1961) Theoretical Igneous Petrology, Wiley.
5. **TURNER, F.J AND VERHOOGEN, J** –(1960.)- Igneous and Metamorphic petrology – McGraw Hill.
6. **HATCH, F.H. WELLS, A.K.** (1949) Petrology of Igneous Rocks, Thomas Murby & Wells,
- JOHANNESSEN, A** – (1962) Descriptive petrography of Igneous Rocks, Vols. I to IV – Allied Pacific.
7. **MACKENZIE, W.S., DONALDSON, C.H. and GUILFORD, C** (1988) Atlas of igneous rocks and their textures, ELBS/Longman.

HOURS PER WEEK:3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS :54
CREDITS : 2

5B08GEO – METAMORPHIC PETROLOGY

MODULE I Metamorphism-definition, factors of metamorphism , types of metamorphism. Prograde and retrograde metamorphism; metasomatism. Metamorphic differentiation (12 hours)

MODULE II Metamorphism in relation to plate tectonics. Paired metamorphic belts. Metamorphic textures and structures. (7 hours)

MODULE III Evolution of the Concept of depths in metamorphism. Barrowian zone of metamorphism. Evolution of the concept of mineral paragenesis in metamorphism. Facies concept. Greenschist facies, Amphibolite facies , Granulite facies, Eclogite facies, Blueschist facies, Contact metamorphic facies. Metamorphic Grade. (15 hours)

MODULE IV Effects of metamorphism on different types of rocks metamorphism on argillaceous rocks, metamorphism on calcareous rocks,metamorphism on arenaceous rock and metamorphism on basic igneous rocks. (10 hours)

MODULE V Petrography, origin and occurrence of the following rock types.Slate, phyllite, schist, gneiss, amphibolite, marble, granulite, mylonite. (10 hours)

LIST OF REFERENCES

- 1.**BAYLY,B.**(1968)Introduction to Petrology. Prentice Hall.
- 2.**HUANG,W.T.**(1962) Petrology,Mc Graw Hill.
- 3.**HARKER, A.** Metamorphism.Mc Graw Hill Co.
- 4.**HYNMAN,D.W.** (1972)Petrology of igneous and Metamorphic Rocks.Mc Graw Hill..
- 5.**MOOREHOUSE,W.W.**(1959)The study of rocks in thin sections. Harper and Row, New York.
- 6.**RAO B.B.**(1986) Metamorphic Petrology, Oxford-IBH Publ. Co.
- 7.**TYRREL, G.W.**(1963)Principles of Petrology. Asia publication.
- 8.**WILLIAMS,H.,TURNER,J.F.andGILBERT,C.M.**(1985)Petrography-An Introduction to the study rocks in thin Sections, Second Edn. CBS Publishers, Delhi.

HOURS PER WEEK :4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 72
CREDITS: 4

SB09GEO STRATIGRAPHY AND SEDIMENTARY PETROLOGY

MODULE-I Definition and scope. A brief study of the guiding principles / laws of Stratigraphy (Principles of Uniformity of processes; principle of superposition; principle of cross-cutting relationships, principle of truncation; principle of included fragments, principle of original horizontality and principle of faunal succession). Concept of stratum and delineation of strata. Its general nomenclature. Concept of facies, lithofacies and biofacies, Local and regional successions. Type area and Type Sections. Breaks in stratigraphic successions: Unconformities and Diastems, Overlap and Offlap. (12 HOURS)

MODULE -II Concept of geological column and Geological Time Scale, Litho stratigraphy and hierarchy of units, Biostratigraphy and hierarchy of units, Dating of strata (relative and absolute dating). Chronostratigraphy and hierarchy of units, Principle of local, regional and interbasinal correlative methods. (15 HOURS)

MODULE III: Origin of Sedimentary rocks – disintegration & decomposition of rocks – transportation – deposition –diagenesis. A broad classification of sedimentary rocks into residual mechanical, chemical and organic Groups. Sedimentary Textures and structures (clastic and non – clastic). (15 HOURS)

MODULE IV: 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, Limestone and Shales. . (15 HOURS)

MODULE V: Chemical deposits – siliceous , carbonaceous, ferruginous and salt deposits. organic deposits – calcareous, siliceous, phosphatic, ferruginous and carbonaceous deposits. A brief study of Flint, Chert, Gypsum, Rock Salt, Caliche. Guano and Kiesellghur. Descriptive study of different types of calcareous and carbonaceous deposits. (15 HOURS)

LIST OF REFERENCES :

1. Dunbar.C.O & Rogers.J 1961 Principles of Stratigraphy. Willey.
2. Krumbein.W.C. &Sloss.L.D 1963 Stratigraphy & Sedimentation.Freeman
3. Tyreel, G.W - Principles of petrology, Asia Publishing House.
4. Huang, W.T. -Petrology, MC Graw Hill
5. Pettijhon, F.J. Sedimentary Rocks, Harper & Bros.
- 6 Harker, A.-Petrology for Students, Cambridge.

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 72
CREDITS : 4

5B10GEO- STRUCTURAL GEOLOGY

MODULE I Stratification, horizontal and inclined beds, Dip and strike, Apparent dip and factors controlling pattern and width of outcrop. Outleir, inleir, Rule of Vs. Clinometers and Brunton compass and its importance, stages of rock deformation-stress and strain, factors controlling rock deformation. Contour lines, topographic maps, geological maps, map symbols and rock symbols, interpretation of geological maps. Basic concept of spherical and stereo graphic projections in structural geology. (15 hours)

MODULE II Foliation and lineation- introduction, mode of occurrence. Joints- nature, origin and classification and geological significance descriptive study and geological significance. Unconformities and their recognition in the field and on the map. (15 hours)

MODULE III Folds: Geometry and elements of folded surface. Geometric and genetic classification of folds, criteria for recognition in the field and on the maps. Fault: Definition, terminology, classification, mechanics of faulting, criteria for recognition of fault in the field and on the map. (15 hours)

MODULE -IV Mountains and rift valleys, Types of mountains, Concept of isostasy and various hypotheses, Origin of Himalayas. (10 hours)

MODULE V Concept of plate tectonics. Major and minor lithospheric plates, plate margins and types, causes of plate movement, sea floor spreading and continental drift, geodynamic elements of earth, Mid ocean ridges, trenches, transform faults and Island arcs. (17 hours)

LIST OF REFERENCES

- 1.BILLINGS M.P.**(1972). Structural Geology. Third Edition. Prentice Hall, New Delhi.
- 2.De SITTER.** Structural Geology. Second Edition. Mc Graw Hill Co.
- 3.HILLS,S.**(1961)Elements of Structural Geology, Asia Publishing House
- 4.LAHEE,**(1987)Field Geology.Sixth Edition. Mc Graw Hall Co.
- 5.RAGAN.**Structural Geology-An Introduction to Geometric Techniques, Second Edition, Wiley.
- 6.SAWKINS,J.S.,CHASE,C.G., DARBY,D.G. and RAPP,G.**(1978).The evolving earth, Mac Millan Publishing Co., New York
- 7.SPENCER,** Structure of the Earth. Wiley.

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 INTERNAL 1

TOTAL HOURS : 72
CREDITS: 4

6B12GEO- GEOLOGY OF INDIA

MODULE -I. A) The three major geological divisions of India and their physiographic, stratigraphic and tectonic characters. B) Regional lithostratigraphic succession of India; major units and general distribution of each. C) The concept of cratons, mobile belts and morpho-tectonic units relevant to Indian Stratigraphy. (10 hours)

MODULE II Archean succession of India. Sargur Super Group; distribution, lithology, structure, associated intrusive and economic resources. Proterozoic succession of India-General distribution and major lithounits. Geographic distribution, lithological features, classification, structural features, associated magmatism, organic remains, age and economic importance of the following lithostratigraphic units.

- | | |
|-------------------------|-------------------------|
| A. Dharwar Super Group | B. Aravalli Super Group |
| C. Delhi Super Group | D. Cuddapah Super Group |
| E. Vindhyan Super Group | F. Kurnool Super Group |
- (20 hours)

MODULE III Paleozoic succession and associated fossils of Spiti region and its Precambrian foundation. Distribution of marine Mesozoic succession in India and detailed study of the following:

- | | |
|--|--|
| a. Triassic Succession of Spiti. | b. Jurassic Succession of Spiti and Kutch. |
| c. Cretaceous succession of Trichy and Narmada Valley. | d. Bagh beds. |

(15 hours)

MODULE IV Gondwana Super Group: Geographic distribution, nature of Gondwana basins, terrestrial and paralic facies, lithology, lithostratigraphic classification, organic remains, age, economic resources, Coastal Gondwana, Deccan traps: extent, distribution, classification, lithological features associated sedimentary rock units, intertrappeans and intratrappeans and dating of Deccan Volcanic activity.

(12 hours)

MODULE V Cenozoic succession of India: A brief study of Paleogene and Neogene lithounit and their distribution in India. Detailed study of the following.

- | | |
|----------------------------------|------------------------------------|
| a. Cenozoic succession of Assam. | b. Siwalik Super group. |
| c. Cuddalore sand stone | d. Quilon and Warkalli formations. |
| e. Karewa group. | f. Indo Gangetic Alluvium |

(15 hours)

LIST OF REFERENCES

1. KRISHNAN MS (1982) Geology of India and Burma, 6th edition.
2. RAVINDRA KUMAR (1985) Fundamentals of Historical geology and stratigraphy of India
3. WADIA AN Geology of India Wiley.

HOURS PER WEEK 3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS 54
CREDIT : 3

6B13GEO - ECONOMIC GEOLOGY

MODULE I : Definition, scope and historical development of Economic Geology. ore minerals and gangue minerals, tenor and grade of ores. Primary and secondary 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 metallogenic epochs and provinces.

(8hours)

MODULE II: Processes of formation of mineral deposits and related deposits-Magmatic deposits. –contact metasomatic deposits-hydrothermal deposits- pegmatitic mineral deposits- hydrothermal deposits- volcanic exhalative deposits- gossans. (13 hours)

MODULE III: Evaporites- sedimentary deposits- oxidation and supergene sulphide enrichment deposits- residual and mechanical concentration deposits, placer deposits- metamorphic deposits. (12 hours)

MODULE IV: Mode of occurrence, distribution in India and important economic uses of the following: Ores of Aluminium, chromium, copper, lead, zinc, gold, manganese, iron, Thorium, uranium, magnesium, tin and titanium. Minerals used as abrasives, refractories, fertilizers, ceramics and gemstones, coal and petroleum. Mineral deposits of Kerala. (12 hours)

MODULE V : Brief outline of the types of exploration of mineral deposits, geological, geophysical, geochemical and geobotanical exploration methods. (9 hours)

REFERENCES:

1. Gokhale and Rao – Ore deposits of India.
2. Jensen and Bateman A.M. – Economic Mineral Deposits.
3. Krishnaswamy, S. – Indian Mineral Resources.
4. Krauskopf – Introduction to Geochemistry.
5. Park and Mac Diarmid -Ore deposits. Freeman
6. Roy chacko PT (ed.), 2005. Mineral resources of Kerala. Dept of mining and geology
7. Sinha, R.K (1982) Industrial minerals. Oxford and IBH Publishing Co.

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 INTERNAL 1

TOTAL HOURS : 72
CREDITS : 3

6B14GEO – PALAEOLOGY

MODULE-I Scope of palaeontology. The origin and evolution of life.. Extraterrestrial origin- Terrestrial origin-chemical basis of origin-Miller’s experiment-theories of organic evolution Methods of preservation of fossils. Body fossils, Trace fossils, Index and Zone fossils, Transported and Leaked fossils. Holotype, Genotype, Paratype, and Proto type. Uses of fossils. (8 HOURS)

MODULE -II Phylum Protozoa –morphology, classification , geological history and stratigraphic importance. An outline of Micro palaeontology, its classification based on shell composition, uses of micro fossils – applications in paleoclimatic paleoceanographic reconstructions– indicators of evolution and migration of life forms – indicators of new deposits of coal and petroleum – life through ages.Phylum Coelentrata –morphology, classification and stratigraphic range of Anthozoan corals. (15 HOURS)

MODULE -III Phylum Brachiopoda:- General morphology, classification and geological history. Phylum mollusca: detailed morphology, classification. Stratigraphic range of pelecypods, gastropods and cephalopods. Suture patterns of cephalopods, evolutionary trends. Phylum Echinodermata-morphology, classification and stratigraphic range of the classes Echinoidea, Crinodea and Blastoidea. (15 HOURS)

MODULE -IV Phylum Arthropoda-morphology and classification of trilobites. Vertebrate paleontology-classification of vertebrates, A brief account of the evolution of fishes, reptiles and mammals. A short account of Siwalik mammals (10 HOURS)

MODULE -V Plant fossils; classification of Plant Kingdom. A short account of the following fossil flora from india;Glossopteris,Gangamopteris,Ptillophyllum,Calamites,Lepidodendron, Williamsonia, and sigillaria. Paleo ecology of plant fossils. (6 HOURS)

REFERENCES:

1. Henry woods : Invertebrate palaeontology – Cambridge.
2. Romer , A.S.: Vertebrate palaeontology, Chicago press.
3. Arnold, C.A., An introduction to Palaeobotany., MC-Graw Hill.
4. B.U. Haq and A. Boersma (1978) Introduction to marine Micropalaeontology. Elsevier, Netherlands
5. Raup, D.M. and Stanely, M.S.: Principles of Palaeontology, CBS Publishers.
6. Moore , R.C., Lalicker , C.G.& Fischer, A.G.: Invertebrate Fossils , Harper brothers
7. Shrock. R.R. and Twenhofel , W.H – 1953: Principles of invertebrate Palaeontology,Arnold publication

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS :72
CREDITS : 3

6 B 15 GEO – PRACTICAL II –PETROLOGY AND ECONOMIC GEOLOGY

Megascopeic and microscopeic identification of the following rocks:

Granite, Graphic granite, Pegmatite, Aplite, Granite Porphyry, Syenite, Syenite porphyry, Diorite, Gabbro, Anorthosite, Dunitite, Pyroxenite, Dolerite, Basalt, Vesicular Basalt, amygdaloidal basalt, Rhyolite, felsites, Obsidian, Pumice, lamprophyre.

Conglomerate, Breccia, Sandstone, Arkose, Shale, Limestone, Laterite, Chert, Grit Lignite. Sandstone, fossiliferous lime stone, kankar lime stone.

Slate, Phyllite, Schists, Gneisses, Quartzite, Marble, Amphibolite, Eclogite, Charnockite, Khondalite, Banded Magnetite quartzite, mafic granulite, marble and khondalite

ECONOMIC GEOLOGY

Megascopeic identification of important ore minerals:

Ore minerals of Iron (Hematite, Magnetite, Siderite, BHQ and BMQ)

Manganese (Pyrolusite, Psilomelane, Wad)

Aluminium (Bauxite)

Lead and Zinc(Galena, Sphalerite)

Copper (Chalcopyrite, Malachite, Azurite, Braunite and native copper)

Chromium minerals(Chromite)

Industrial minerals:

Micas(Muscovite and Biotite)

Refractories(Graphite, Kyanite, Sillimanite, Barite)

Asbestose minerals(Chrysotile and Serpentine)

Sulphur minerals(Sulphur, pyrites, Orpiment, Realgar)

Abrasives (Talc, Quartz, Corundum, Garnet)

Gemstones(Quartz, Tourmaline, Garnet, Topaz and Beryl)

Fertilizer minerals(Gypsum, Anhydrite, calcite, dolomite)

Coal (Peat, Lignite, Bituminous coal, Anthrasite)

Petroleum (Crude oil)

Radio active minerals (Monazite, Ilmenite, Rutile)

Clay minerals(Kaolinite, Ball clay)

HOURS PER WEEK : 4
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS :72
CREDITS : 3

6B 16 GEO- PRACTICAL III-STRUCTURAL GEOLOGY AND PALAEONTOLOGY

Illustration with the help of neat diagrams of the following: Attitude of beds, apparent dip, strike and dip symbols, types of folds, faults and unconformities.

Simple problems in structural geology. Problems involving true and apparent dip, thickness and width of outcrops, three point problems. Interpretation of geological maps and preparation of sections.

- Simple horizontal beds (2 maps)
- Study of effect of relief on 'V' of outcrops (4 maps)
- Simple dipping beds (2 maps)
- Simple dipping beds with intrusions (2 Maps)
- Tracing the out crops (3 maps)
- Folded beds (5 maps)
- Maps with different types of faults (5 maps)
- Simple dipping beds with unconformity (5 maps)
- Combination of intrusions, unconformity, folds and faults (10 maps)

PALAEONTOLOGY

Morphological studies of the following fossils

Protozoa: Lagenas, Nodosaria, Textularia, Nummulites, Globigerina.

Coelentrata: Calceola, Zaphrentis, Halysites, Favosites, Montlivaltia.

Brachiopoda: Spirifer, Productus, Terebratula, Rhynchonella, Athyris, Orthis, Lingula

Mollusca: Gasteropoda (Natica, Turbo, Trochus, Turritella, Cerethium, Conus, Murex, cypraea, Physa)

Cephalopodes (Nautilus, Goniatites, Orthoceras, Phylloceras, Baculites, Schloenbachia, Ceratites, Acanthoceras,)

Pelecypoda (Arca, Trigonina, Nucula, Spondylus, Pecten, Inoceramus, Ostrea, Gryphaea, Alectryonia.

Echinodermata: Pentacrinus, Cidaris, Hemicidaris, Echinus, Micraster, Holaster, Encrinurus, Apiuocrinus

Plant fossils: Glossopteris, Gangamopteris, Ptilophyllum, Lepidodendron, Sigillaria, Calamites, Elatocladus.

HOURS PER WEEK : 3
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS 54
CREDITS :3

5B 11 GEO / 6B 17 GEO--DISASTER MANAGEMENT

MODULE I Objectives and scope-Natural and non natural disasters. Definition of ecology and environmental geology- different ecosystems, classification of natural resources. A brief description of renewable and non-renewable resources. Water and climate related; geologically related; Biologically related, chemical and nuclear disasters, general awareness on EIA. (10 hours)

MODULE II Land slides; causes of landslides-hazards pertaining to land slides and management planning for landslide disaster. Soil erosion-process of formation of soil, soil horizon, soil properties, soil classification, causes of soil erosion, effects of soil erosion, strategies to prevent soil erosion. Floods; causes, effects and disaster management techniques. (12 hours)

MODULE III Earthquakes; causative factors, seismic waves, distribution of seismicity in India, hazards related to earthquake, earthquake disaster management planning. Volcanoes; causes, effects and hazard management methods. (10 hours)

MODULE IV Environmental problems associated with human activities; impact of sand mining on environment. Impact of mining on environment. Problems inflicted by granite mining. Coastal erosion- effects and remedial measures. Tsunamis- origin, significance and prediction (12 hours)

MODULE V Pollution; surface water and subsurface-ground water pollution-strategies for reducing pollution. Impact of radioactive waste disposal on environment. Effects of urbanization, and impact of population explosion. Landfill waste management. (10 hours)

LIST OF REFERENCES

1. Abbott .P.C (2002); Natural Disasters, Mcraw- Hill Publications-New Delhi
2. Coates D.R (1985) ; Geology and society chapman and hall publishers- New Delhi
3. Davis etal (1976) Environmental Geoscience Niley Eastern
4. Howard .A.D and Irwin Remson (1978); Geology in Environmental Planning, M.C Graw-hill publications
5. Keller. E.A (1976); Environmental Geology. Charles E.Merril Publishers, New Jerseys
6. Lundgren. L. (1986) Environmental Geology. Prentice-Hall publishers, New Jerseys
7. Strahler. N. and Strahler. A.H (1973); Environmental Geoscience; Willey eastern

HOURS PER WEEK: 3

TOTAL HOURS :54

WEIGHT EXTERNAL 3 AND INTERNAL 1

CREDIT: 3

5B 11 GEO/ 6B 17 GEO- PETROLEUM GEOLOGY

MODULE I Petroleum Geology- Introduction, scope and importance. Properties Oil and Natural Gas - Specific Gravity, API, Fluorescence, Viscosity, Pour Point, Heavy Oil, Cloud Point, Gel Point, Physical & Chemical Properties, Chemical Composition, Economic importance; Geologic factors. Origin of Petroleum- Theories - regarding Organic and Inorganic origin of petroleum, Evidences supportive of both theories. Kerogen- types, formation of Kerogen, Maturation of Kerogen, Types of organic matter, Thermal maturation of petroleum, Oil Window. (12 hours)

MODULE II Migration of Petroleum, types of migration, Expulsion of Petroleum, Accumulation of Petroleum. Petroleum System- Source Rock, Reservoir Rock, Seals, Traps, Source Rock Characters, Reservoir Rocks, Porosity, Permeability, Effects of Diagenesis on Reservoir Quality, Reservoir Fluids- Water, Oil and Gas, Traps- Structural and Stratigraphic, Combination Traps, Hydrodynamic Traps, Timing of Trap Development Relative to Migration. Oil field waters and their effect on Hydrocarbons. (12 hours)

MODULE III Oil Field Exploration Processes- Geochemical, Gravity- Magnetic, seismic processes. Seismic stratigraphy & Sequence Analysis. 2D and 3-D seismics. Sub surface maps- Isopachs , Structure contour maps. Drilling Processes- Onshore and Offshore Drilling Technology. Abnormal Pressures. Sigma log, D-exponent studies. Well Testing Procedures- Types of testing, Reservoir Pressure and temperature and their importance. (12 hours)

MODULE IV Well Logging – Principles . basis and use of logging in stratigraphic correlation and detection of Hydrocarbons. Resistivity, water saturation, Archies Equation. Types of Logs – Resistivity ,SP, Gamma, Caliper, Porosity logs-Neutron and Sonic, Density, Dipmeter, CBL-VDL, Production logging and modern Schlumberger logs (10 hours)

MODULE V Calculation of Reserves, Types of Reserves. New Exploration Trends- Gas Hydrates .Deep water petroleum deposits. Petroleum Habitats - Depositional processes and environments. Shallow water, deep water deposition, carbonate platform deposits. Petroleum Basins and fields and their distribution –Indian and global contexts. (8 hours)

LIST OF REFERENCES

- 1.Levorson A.I. 1958. Geology of Petroleum, McGraw Hill.
- 2.Tissot B.P. and Welta D. H. 1978.Petroleum formation and occurrence, Springer Verlag.
- 3.Hobson G. D. and Tiratsoo E. N. 1981. Introduction to Petroleum Geology. Scientific Press Ltd.

MODEL QUESTION PAPERS IN BSc. GEOLOGY

SEMESTER PATTERN

INSTRUCTIONS TO THE QUESTION PAPER SETTERS

- 1. Pattern of Questions:** A judicious mix of questions which assess (i) knowledge acquired (ii) standard application of knowledge; (iii) application of knowledge in new situations (iv) critical evaluation of knowledge and (v) the ability to synthesize knowledge drawn from various sources would be required. The question setter shall ensure that questions covering all skills are set. He shall also submit a detailed scheme of evaluation along with the question paper.
2. A question paper shall be a judicious mix of objective type, short answer type, short essay type/problem solving type and essay type questions
3. Different type of questions will be given different weights to quantify their range as follows

S.No.	Type of Questions	Weight
1	A bunch of 4 objective type questions	1
2	Short answer type questions	1
3	Short essay/problem solving type questions	2
4	Essay type questions	4

1. One bunch of 4 questions –answer to the point
Another bunch of 4 questions to state true or false
Another bunch of 4 questions to fill up the blanks
Another bunch of 4 questions to match the following
Another bunch of 4 questions giving multiple choice answers
Ask 4 bunches from the above model .
2. For short answer type questions 8 has to be answered out of 10 questions
3. Short essay/problem solving type questions 5 has to be answered out of 7
4. Essay type questions 2 with internal choice has to be answered out of 4
5. Care must be taken while framing the questions. In all the four types, questions should be evenly asked from all modules.
6. In the case of papers where there are two sections care must be taken to ask the essay questions in such a way that internal choice is from one section so that the student will have to attend both sections.
7. The question paper setters are requested to submit the question paper with correct spelling especially the scientific terms. Mistake can be minimized if the set question paper is type set.
8. Some of the model question paper is given below. In the case of core papers, Elective papers and open courses for other streams the same pattern may be followed.
9. Answer key and scheme of valuation should be prepared by the setter.

KANNUR UNIVERSITY
I SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT: GEOLOGY

1B01GEO- INTRODUCTION TO EARTH SCIENCES

Time : Three Hours

TOTAL WEIGHT 30

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. The second nearest Planet to the Earth.
2. Steep walled ,deep narrow river valley.
3. Instrument that record earthquake.
4. Topography produced by a large number of drumlins

5-8 will have a weightage of 1

5. Central volcano with a big depression at the summit
- 6 The submerged outer border of the continent
- 7 The youngest mountain chain in India
- 8 The top surface of continuous body of water

9-12 will have a weightage of 1

- 9 A freely developing bend in a river
- 10 The pile of debris around the end of a glacier
- 11 Violent spewing out of hot groundwater steam
- 12 A pebble, cobble or boulder having its shape or surface modified by wind blown sand

13-16 will have a weightage of 1

13. Flat topped sea mount.
11. Point of origin of earthquake.
15. The percentage of CO₂ in the atmosphere.
16. Discontinuity between crust and mantle.

Distinguish between any eight of the following pairs. Each question will have a weightage of 1

- 17 U shaped and V shaped valleys
- 18 Mesa and Butte
- 19 Porosity and permeability
- 20 Stalactite and stalagmite
- 21 Spheroidal weathering and sheet weathering
- 22 Flood plain and delta
- 23 Geyser and artesian spring
24. Crust and Mantle
25. P wave and S wave
- 26 Continental rise and Abyssal plain

Explain any five of the following in not more than a page . Each question will have a weightage of 2

- 27 Aquifer
- 28 Tides
- 29 Lithosphere
- 30 Tsunamis
- 31 Differential weathering
- 32 Earth as a magnet
- 33 Volcanic products

Answer long answer type question from the following. Each question will have a weightage of 4

- 34 Give an account on the development and evolution of fluvial land forms.
Or
- 35 Describe the processes of glacial erosion, transportation and deposition. Add a note on the different types of glaciers and glacial land forms
- 36. Describe the important geomorphic features of the ocean Floor.
Or
- 37. Describe the various methods followed in determining the age of the earth.

KANNUR UNIVERSITY
II SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT: GEOLOGY

2B02 GEO -METHODOLOGY AND PERSPECTIVES IN SCIENCE STREAM
WITH SPECIAL REFERENCE TO GEOLOGICAL STUDIES

Time : Three Hours

Total weight 30

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. What is Zoology
2. The instrument used for the determination of strike and dip of beds.
3. The organization involved in the preparation of topographic maps.
4. What is disproving

5-8 will have a weightage of 1

5. Basic principle of the working of clinometers.
6. The geomorphological unit with maximum slope.
7. The apex organization in india involved in the ground water Management, monitoring and resource activities.
8. The plant indicate shallow depths to the water table.

9-12 will have a weightage of 1

9. The topmost point of a masonry dam
10. The effect of stress applied on materials.
11. Comperised mapping techniques used for the analysis of various types of geological problems.
12. Common type of electrode spacing used in the electrical resistivity survey for ground water prospecting.

13-16 will have a weightage of 1

13. The sudden movement of rock masses due to the influence of gravity.
14. In a topographic map, the infrastructural facilities are denoted by-----
15. The angle between inclined plane and a horizontal plane.
16. Name a small scale map.

Define any eight of the following .Each question will have a weightage of 1

17. Scale of a map
18. Vocabulary of Science
19. Brunton compass
20. Peer Review
21. Cadestral maps
22. Precision of instrument
23. Plagiarism
24. Uniformitarianism
25. Rocks
26. Patent

Explain any five of the following in not more than a page . Each question will have a weightage of 2 .

- 27 Fossils
- 28 Statistical tools
- 29 Scientific instruments
- 30 Preparation of field report
- 31 Hypotheses
- 32 Disciplines of sciences
- 33. Catastrophism

Answer long answer type question from the following. Each question will have a weightage of 4

- 34. Describe various types of field and lab instruments used in Geological studies.
Or
- 35. Give a Brief account on ethics in science
- 36 Write an essay on methods and tools in science
Or
- 37 What is science ? Give a brief account on types of knowledge.

KANNUR UNIVERSITY
III SEMESTER BSc.PROGRAMME
STREAM SCIENCE – CORE SUBJECT: GEOLOGY

3B03GEO- GEOINFORMATICS

Time : Three Hours

Maximum 30 WEIGHTS

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. RAM stands for what?
2. An example of a GIS output device.
3. The company which introduced i-pods
4. Ubuntu and Vista are examples of what?

5-8 will have a weightage of 1

5. AMD Athlon and Intel Dual Core are names of what?
6. What does NT in Windows NT stand for?
7. Who developed wikipedia?
8. Using others ideas as ones own without acknowledgement

9-12 will have a weightage of 1

9. The number of satellites constituting a GPS constellation
10. The third component of a GPS signal other than the digital code and the navigation message.
11. Where was GIS first developed?
12. The three components of a GIS system.

13-16 will have a weightage of 1

13. Name an area query operation in GIS
14. Name a point query operation in GIS
15. The logic used in most GIS packages
16. An example of a Free GIS package
- 17.

Write short notes on any eight of the following .Each question will have a weightage of 1

- 17 DVD
- 18 RFID
- 19 Windows XP
- 20 LINUX
- 21 GPS Receivers
- 22 Google earth
- 23 Arc GIS
- 24 Buffer
25. Zip drives
- 26 Wikipedia

Explain any five of the following in not more than a page . Each question will have a weightage of 2.

- 27 Newer Multimedia device
- 28 e-governance initiatives of Govt.of Kerala.
- 29 GPS Satellites
- 30 History of the development of GIS
- 31 Application of GIS in water quality
- 32 Pen drives
- 33 Mobile phones

Answer long answer type question from the following. Each question will have a weightage of 4.

- 34. Give a brief account on the salient features of free and proprietary softwares.
OR
- 35. Give an account on the types and nature of spatial data in geology and hydrogeology entered in GIS
- 36. What is GPS. Give a detailed account on the use of GPS in various fields.
Or
- 37. What are specifications of modern personal computers.

KANNUR UNIVERSITY
III SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT: GEOLOGY

3B04GEO-CRYSTALLOGRAPHY

Time : Three Hours

Maximum 30 WEIGHTS

Answer all questions

Students will be graded based on their answers.

(A bunch of 4 questions having Weightage 1)

Name the following

1. The crystal form having maximum number of faces.
2. A crystal class having only centre of symmetry.
3. Type mineral of rhombohedral hemimorphic class.
4. Instrument used for measuring interfacial angles of crystals

Fill in the blanks

5. Tetrahedron is the hemihedral form of-----
6. Miller indices corresponding to the Weiss symbol $2a, 1b, \infty c$ is-----
7. Number of faces in pinacoid -----
8. Symmetry operation associated with axis of symmetry is -----

Choose the correct answer

9. The miller symbol for clinodome
a. {hol} b. (okl) c. (hkl) d. (hhl)
10. Prisms are forms with
a. vertical faces b. inclined faces c. horizontal faces
d. none of these
11. Jollys spring balance is used to determine
a. luster b. hardness c. specific gravity d. streak
12. Holohedral form of diploid
a. trapezohedron b. trisoctahedron c. tetrahexahedron d. hexoctahedron

Match the following

- | | |
|-------------|--------------|
| 13. Calcite | Cubic |
| 14. Galena | Monoclinic |
| 15. Gypsum | Triclinic |
| 16. Axinite | Rhombohedral |

Write short notes on any 8 of the following. (Each question with weightage 1)

17. Law of constancy of interfacial angle.
18. Crystal imperfections.
19. Open and closed forms.
20. Symmetry elements in the normal class of the monoclinic system.
21. Zone.

22. Axial ratio.
23. Parameter
24. Cleavage
25. Pyramid of first order in the Tetragonal system
26. Enantiomorphous forms

Write short essays on any 5 of the following . (Each question with weightage 2)

27. Symmetry and forms present in normal class of Triclinic system.
28. Concept of symmetry in crystals.
29. Hardness of minerals
30. Stereographic projections.
31. Hemimorphism
32. Miller indices.
33. Contact Goniometer

Write essay on two of the following. (Each question with weightage 4)

34. Describe the symmetry elements and forms present in the Rhombohedral class of Hexagonal system.

Or

35. Describe the symmetry elements and forms present in the Normal class of the orthorhombic system.

36. Write an essay on various types of twinning seen in crystals with suitable examples.

Or

37. Describe the symmetry elements and forms present in the normal class of Isometric system.

KANNUR UNIVERSITY
IV SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT: GEOLOGY

4B05GEO- MINERALOGY

Time : Three Hours

Max; 30 Weights

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. In india radioactive minerals are obtained from_____
2. Hardness of topaz is -----
3. Lustre in Mica is-----
4. Composition of orthoclase is

State true or false 5-8 will have a weightage of 1

5. Hardness of Quartz is 8
6. Composition of Galena is ZnS
7. Ab-An is an isomorphous series
8. Olivine is a chain silicate

Match the following 9-12 will have a weightage of 1

- | | | |
|----|----------------------------------|-------------|
| 9 | Feldspathoid | Sillimanite |
| 10 | Al ₂ SiO ₅ | Leucite |
| 11 | Nicol prism | Quartz |
| 12 | Polymorphism | Calcite |

13-16 will have a weightage of 1

13. Habit of analcite .
14. Bonding in Diamond.
15. Optic sign of Calcite.
16. Silicate structure of Beryl

Distuinguish between any eight of the following pairs.Each question will have a weightage of 1

17. Orthoclase and Microcline
18. Crystalline and amorphous
19. Lustre and transparency
20. Solid solution and exsolution
21. Uniaxial and Biaxial
22. Magnetite and hematite
23. Nesosilicate and sorosilicate
24. Albite and nepheline
25. Gypsum plate and mica plate
26. Piezo electricity and pyro electricity

Explain any five of the following in not more than a page . Each question will have a weightage of 2.

27. Hardness of minerals
- 28 Pseudomorphism
- 29 Pleochroism
- 30 Bauxite
- 31 Clay minerals
- 32 Double refraction
- 33 Cleavage

Answer long answer type question from the following. Each question will have a weightage of 4

34. Give an account on the determination of the physical properties of minerals.

Or

- 35 Describe the processes of construction of nicol prism

- 36 Describe the important physical, chemical and optical properties of Amphibole Group of minerals.

Or

37. Describe the various methods followed in the determination of Optic sign.

**Sd/-
V.Gopinathan,
Chairman,BOS Geology(Cd)**



KANNUR UNIVERSITY

COURSE STRUCTURE

&

SYLLABUS

OPEN COURSES (GEOLOGY)

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

W.E.F 2009 ADMISSION

Scheme Open Courses

Semester	Course Code	Name of the Course	Hours/Week	Credits
V	5D01GEO	Earth Sciences	2	2
VI	6D01GEO	Gemology and Decorative Stones	2	2
VI	6D02GEO	Environmental Geology	2	2

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

5 D 01GEO EARTH SCIENCES

MODULE I Introduction to Earth Science- Geology-different branches of Geology.

The Universe – The cosmic Environment - The earth: Size, Shape, Density, Volume. Current concept of the origin of earth Age of the earth. Interior of the Earth. Geospheres and their interactions .Atmosphere-composition and structure.. Hydrosphere, its components, hydrologic cycle. Lithosphere and its characteristics. (8 Hours)

MODULE II Earth's internal and external processes: Magmatic activity. Weathering: agents, types, products and controlling factors. Soils and soil horizons. Landslides and mass wasting . Streams – erosional and depositional features. Ground water - erosional and depositional landscapes produced by the action of ground water. Water table, Hydrologic cycle. Wind: - Erosional and depositional landforms. Glaciers: Erosional and depositional landforms. (8 Hours)

MODULE III Oceans and seas – Continental margin , Continental Slope and abyssal plains. Coral reef- Geomorphic features of the ocean floor. Volcanoes: Distribution, types . Products of volcanism (lava, magma, pyroclastics). Earthquakes: causes, seismic waves, detection, epicenter, focus, seismogram and seismographs, intensity and magnitude. Seismic belt of the world. (8 Hours)

MODULE IV Minerals and rocks – mineral definition, salient physical properties-color, streak, luster, cleavage, hardness, magnetic properties. General classification: study of following minerals, quartz, feldspars, pyroxenes, amphibole, calcite, mica, magnetite, garnet, graphite and asbestos. Major types of rocks (igneous, Sedimentary and metamorphic) the study of the following rock types—granite, basalt, dunite, obsidian, pegmatite, sandstone, conglomerate, breccias, shale, gneiss, schist, marble, slate, quartzite, (8 Hours)

MODULE V Palaeontology -Fossils- nature of fossils, processes of fossilization .Geological Time Scale. Earth resources- coal, peat, ore minerals, oil and natural gas, industrial minerals, gemstones and precious stones, building stones. Environmental geology and disaster management. (4 Hours)

LIST OF REFERENCES

1. Arthur Holmes-Principles of Physical Geology
2. Arthur N. Strahler- The Earth Sciences
3. Donald R Coates, 1981, Environmental Geology, John Wiley and sons
4. Thornbury .W.D Principles of Geomorphology, Wiley 1968
5. Dana, E.S. 1955 – A text book of mineralogy – Asia publishing House, Wiley.
6. Henry woods: Invertebrate palaeontology – Cambridge
7. Raup, D.M. and Stanley, M.S.: Principles of Palaeontology, CBS Publishers.
8. Tyrrell, G.W. 1978 -Principles of petrology – Chapman and Hall Ltd., London.

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

6 D 01GEO GEMOLOGY AND DECORATIVE STONES

MODULE I Gemology-Definition and scope of Gemstones, Attributes of Gemstones, Characteristics and classification-colour, cut, carat and Chatoyancy. Value of gemstones, Grading, Cutting and polishing. (8 Hours)

MODULE II Treatments applied to gemstones- Heat, Radiation, Waxing/oiling, Fracture filling. Synthetic and artificial gemstones. Physical, Chemical and Optical Properties of Gemstones. Healing properties of gemstones. (8 Hours)

MODULE III Gem cutting instruments, Industrial applications of gemstones, Gem industrial centres in India and world, Gemstones of India – Distribution, geological setting and genesis, Gemstones of Kerala – Distribution, geological setting and genesis. (8 Hours)

MODULE IV Dimensional and decorative stones: Definition, Engineering properties of dimensional and decorative stones. Rock hardness/Polishing hardness, water absorption, texture, structure and color. Determination of minerals-Pyrite, garnet, olivine. (8 Hours)

MODULE V Granite mining; methods, blasting, diamond wire cutting, wedging and splitting, thermal cutting, polishing of granites. Granite mining industries in India. Paradise of granites, black granite, Galaxy, Pacific blue. Kerala and Indian occurrence, export potential of granites. (8 Hours)

Sd/-
V.Gopinathan,
Chairman,BOS Geology(Cd)



KANNUR UNIVERSITY

COURSE STRUCTURE

&

SYLLABUS

GEOLOGY (COMPLEMENTARY)

With effect from 2009 Admission

UNDER

CHOICE BASED CREDIT SEMESTER SYSTEM

Scheme Geology(Complementary)

Semester	Course Code	Name of the Course	Hours/Week	Credits
1	1C01GEO	Geology I	2	2
1	1C02GEO	Geology I Practical	2	*
2	2C03GEO	Geology II	2	2
2	2C04GEO	Geology II Practical	2	2
3	3C05GEO	Geology III	2	2
3	3C06GEO	Geology III Practical	2	*
4	4C07GEO	Geology IV	2	2
4	4C08GEO	Geology IV Practical	2	2

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS :2

1C01GEO- GEOLOGY I

Module I: Geology – an introduction. The earth – its dimensions, age, and internal structure. Relative age and absolute age of the earth. Processes in geology – agents, energy, classification. The rock cycle, and the three rock types. Plate tectonics, palaeomagnetism, seafloor spreading. (9 hrs)

ModuleII Weathering – Physical weathering and chemical weathering. Soils – their formation, types in India, erosion and a typical tropical soil profile. (9 hrs)

Module III Mountains – types. Orogeny. Mass movements – different types and their classification, Causes and effects of landslides. (9 hrs)

Module IV: Groundwater and its sources. Sources of ground water. Hydrologic cycle. Subsurface occurrence of groundwater. Aquifers, aquicludes, aquitard, aquifuge – types of aquifers – confined, unconfined and artesian aquifers – springs. Recharge and discharge of groundwater – different types of wells. Geological work of groundwater. (9 hrs)

HOURS PER WEEK :2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS: 36
CREDITS : 2

2 C03 GEO- GEOLOGY II

MODULE 1. Streams – overland flow, channel flow. Types of streams. Drainage basins, patterns. Geological work of streams – erosion, transportation, deposition – types of loads – long profile of stream – graded stream. Concept of base level – fluvial aggradational and degradational landforms. (8 hrs)

MODULE II. Glaciers – types, distribution, geological work – glacial landforms, moraines. Wind – geological action of wind – aeolian landforms .Oceans and seas – geological activity of ocean and sea waves. Sea level changes and their causes. Submarine topography, coral reefs, coastal landforms – marine sediments. (8 hrs)

MODULE III Volcanoes – mechanism, types, products. Distribution of volcanoes, volcanic landforms. Earthquakes – causes, types, seismic waves, epicentre, focus, isoseismal lines, intensity and magnitude, seismic belts. Interior of the earth. (8 hrs)

MODULE IV Minerals and crystals – study of crystals and its significance in mineral identification. Physical properties of minerals – colour, streak, lustre, transparency, fracture, cleavage, hardness, specific gravity, magnetism (4 hrs)

MODULE V .Chemical composition and diagnostic properties of the following minerals:-Quartz, feldspar, biotite, muscovite, hornblende, calcite, garnet, hematite, gypsum, kyanite, sillimanite, magnetite, chromite, pyrite, chalcopyrite, apatite, actinolite, beryl, magnesite, fluorite, talc, pyrolusite, galena, dolomite, corundum, graphite, sphalerite, diamond, coal, asbestos, monazite, bauxite. (8 hrs)

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

3 C05 GEO- GEOLOGY III

MODULE 1. Magma – physical and chemical properties, lava and its types. Igneous rocks – texture, mode of occurrence – dykes, sills, laccolith, lopolith, stock, batholith, phacolith. Classification of igneous rocks – megascopic study of igneous rock types – granite, pegmatite, rhyolite, dunite, dolerite, pumice, syenite, gabbro, diorite, basalt.

(9 hrs)

MODULE 11 Brief study of sediments and sedimentary rocks. Structural and textural features – field classification. Megascopic study of the following sedimentary rocks – sandstone, shale, limestone, conglomerate, breccia, laterite. Metamorphism – types and factors. Textures of metamorphic rocks. Megascopic study of the following metamorphic rocks – phyllite, slate, schist, gneiss, quartzite, marble, granulite, charnockite, khondalite.

(9 hrs)

MODULE I II Topographical maps and geological maps – their preparation, conventional symbols. Structural features controlling landform development. Outcrops, strike and dip of surfaces, primary and secondary structures, unconformities and their geological significance. Folds, geometrical elements – geometrical classification, brief study of the following – antiform, synform, anticline, syncline, isoclinal fold, recumbent fold, overturned fold, geanticline, geosyncline, anti and synclinoriums.

(9 hrs)

MODULE 1V Faults – terminologies, types, study of the following – normal, reverse, strike slip and dip slip faults, horst, graben, rift valley. Joints – types and geological significance. Foliation and lineation.

(9 hrs)

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 AND INTERNAL 1

TOTAL HOURS : 36
CREDITS : 2

4 C07 GEO- GEOLOGY IV

MODULE 1. Stratigraphy – its content, basic principles, uniformitarianism, superposition, lateral continuity, original horizontality, faunal succession, faunal assemblages. Geological time scale and basic time units – eon, era, period, epoch. Major geological divisions of India – brief study of the stratigraphy of Kerala – Precambrian, Tertiary and Quaternary formations. (9 hrs)

MODULE II. Palaeontology – its branches, fossils, types of fossilization, and uses of fossils. General morphological features of typical brachiopod, pelecypod, gastropod and arthropod.) (8 hrs)

MODULE III. Economic geology – ore, gangue and industrial minerals. Brief study of important processes of ore mineral formation. Magmatism, hydrothermal process, volcanism, contact metasomatism, metamorphism, evaporites, residual and mechanical concentration, supergene sulphide enrichment. (10 hrs)

MODULE IV . Mode of occurrence, geographic location in India, and geology of the following mineral deposits.

Iron – Kudremukh, Karnataka

Lead and Zinc – Zawar, Rajasthan

Gold – Kolar, Karnataka

Mica – Nellore, Andhra Pradesh

Manganese – Chindwara, Madhya Pradesh

Copper – Khetri, Rajasthan

Aluminium – Koraput, Orissa

Lignite – Neyveli, Tamil Nadu

Coal – Bokaro, Bihar

Petroleum – Naharkotiya, Assam and Bombay High

(9 hrs)

HOURS PER WEEK :2

TOTAL HOURS : 36

CREDITS : 0

1 C 02 GEO- GEOLOGY PRACTICAL

1. Preparation of diagrams of the following – rock cycle, hydrological cycle, subsurface groundwater occurrence, confined, unconfined and artesian aquifers.
2. Preparation of diagram of typical soil profile.
- 3.

HOURS PER WEEK : 2

TOTAL HOURS :36

WEIGHT EXTERNAL 3 INTERNAL 1

CREDITS 2

2 C04 GEO- GEOLOGY PRACTICAL

1. Exercises in identification of salient topographic and drainage features using topographic maps. 1 : 50,000 or 1 : 25,000 Survey of India of toposheets.
 2. Megascopic identification of rock forming minerals and ore minerals listed in the theory part of the syllabus.
- Also revision of practicals done during I Semester .

HOURS PER WEEK :2

TOTAL HOURS :36

0 CREDITS

3 C06 GEO- GEOLOGY PRACTICAL

1. Preparation of chart showing classification of igneous, metamorphic and sedimentary rocks.
2. Block diagrams of the following: fold - anticline, syncline, recumbent fold, isoclinal fold. Fault – normal, reverse, dipslip, strike slip, graben, horst. Unconformity – angular, disconformity, non-conformity. Joints, dykes, sills, laccolith, lopolith, batholith, phaccolith.
3. Measurement of slope and distance in topographic maps. Completion of outcrops in contour maps. Determination of strike and dip of formations from maps. Interpretation of geological maps with simple structures (fold, fault, unconformity).

HOURS PER WEEK : 2
WEIGHT EXTERNAL 3 INTERNAL 1

TOTAL HOURS : 36
CREDITS :2

4 C 08 GEO- GEOLOGY PRACTICAL

1. Preparation of chart of geological time scale, mineral map of Kerala, map of India showing locations of important mineral deposits mentioned in the theory syllabus.
2. Geological map of Kerala showing distribution of major stratigraphic units.
3. Diagram of a shell of a typical brachiopod, pelecypod, gastropod (ammonite) and trilobite.

LIST OF REFERENCE

1. Physical Geology: Exploring the Earth James Stewart Monroe, Reed Wicander 2005 Thomson Brooks/Cole 644 page
2. Cliffs Quick Review Physical Geology Mark J. Crawford 1998 Wiley 258 p
3. Earth: An Introduction to Physical Geology Edward J. Tarbuck, Frederick K. Lutgens, Dennis Tasa 2007 Pearson 720 p
4. Umeshwar Prasad 2004 Economic Mineral Deposits
5. Dynamic Earth: An Introduction to Physical Geology Brian J. Skinner, Stephen C. Porter, Jeffrey Park, Tom Freeman 2006 John Wiley 584 p
6. Laboratory Manual for Physical Geology James H Zumberge, Robert H. Rutherford, James L Carter 2006 McGraw-Hill Higher Education 289 p
7. How Does Earth Work?: Physical Geology and the Process of Science Gary Allen Smith, Aurora Pun 2006 Pearson Prentice Hall 641 p
8. The Field Guide to Geology David Lambert 2007 Facts On File, Inc. 304 p
9. Geology from Experience: Hands-on Labs and Problems in Physical Geology E. Kirsten Peters, Larry E. Davis 2000 W. H. Freeman 320 p
10. Exercises in Physical Geology W. Kenneth Hamblin, James D. Howard 2004 Pearson 304 p
11. Earth Science: Geology, the Environment, and the Universe Glencoe 2001 McGraw-Hill 970p
12. Cambridge Guide to Minerals, Rocks and Fossils Arthur Clive Bishop, A. Bishop, Alan Robert Woolley 1999 Cambridge University Press 336 p
13. Fossils:A Photographic Field Guide Chris Pellant and Helen Pellant 2007 New Holland Publishers 144 p
14. Fossils at a Glance Clare Milsom, Susan Rigby 2003 Blackwell Publishing 155 p

KANNUR UNIVERSITY
IV SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT : GEOGRAPHY

COMPLEMENTARY COURSE -GEOLOGY
1C01GEO- GEOLOGY

TIME 3 HOURS

Maximum weight 30

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. The equatorial dimension of the earth
2. Age of the earth
3. The layer of the earth between the crust and the mantle.
4. The driving force of all energy – matter interactions in the Earth

5-8 will have a weightage of 1

5. The agent of weathering involved in arid regions
6. The end stage of sedimentary processes
7. Who proposed the concept of Continental Drift ?
8. Will sediments be oldest near the mid-oceanic ridge or away from it?

9-12 will have a weightage of 1

9. The temperature below which a mineral acquires its magnetism
10. Regolith deposits that have been transported primarily by gravity and mass wasting processes
11. Grains with size between 4 mm – 16 mm
12. Aravalli mountains represent what type of mountain?

13-16 will have a weightage of 1

13. Chemical and physical processes that alter regolith into soil
14. The driving force of mass wasting, erosion and transportation
15. Very slow, imperceptible, movement of slope materials down slope
16. Percentage of world's water found underground

Answer any eight of the following in not less than a paragraph .Each question will have a weightage of 1

17. Crust
18. Hotspots
19. Talus
20. Orogeny
21. Solifluction
22. Aquifer
23. Landslides
24. Age of the earth
25. Hydrological cycle
26. Soil profile

Explain any five of the following in not more than a page . Each question will have a weightage of 2.

27. Volcanic rocks
28. Polar wandering
29. Tides
30. Lithosphere
31. Tsunamis
32. Differential weathering
33. Structure of water bearing rocks

Answer long answer type question from the following. Each question will have a weightage of 4

34. Give an account on the development and evolution of fluvial land forms.
Or
35. Describe the processes of glacial erosion, transportation and deposition. Add a note on the different types of glaciers and glacial land forms
36. Describe the important geomorphic features of the ocean floor.
Or
37. Describe the various methods followed in determining the age of the earth.

**KANNUR UNIVERSITY
IV SEMESTER BSc. PROGRAMME**

**STREAM SCIENCE – CORE SUBJECT : GEOGRAPHY
COMPLEMENTARY SUBJECT -GEOLOGY**

2C03 GEO- GEOLOGY

TIME 3 HOURS

Maximum weight 30

*Answer all questions
Students will be graded based on their answers.*

Answer the following

1-4 will have a weightage of 1

1. The driving force of hydrological cycle
2. The process of soaking up of water into the ground
3. Flow of water in which water flows in an erratic and confused maner
4. The maximum load of solid particles that the stream can transport

5-8 will have a weightage of 1

5. Saucer-shaped depression at the head of a valley glacier
6. The average salinity of ocean water
7. Sea-level changes of global dimensions
8. Flat topped submarine mountain

9-12 will have a weightage of 1

9. The Hawaiian Islands are an example of which type of volcano
10. In order to determine the epicenter of an earthquake, the minimum number of seismic stations required is.....
11. Among coastal, fluvial, aeolian environments which shows the least amount of sorting and stratification
12. The fastest seismic wave

13-16 will have a weightage of 1

13. Coral reef enclosing a lagoon between land and ocean
14. The most common element in the earth's crust
15. The mineral with the formula Al_2SiO_5
16. Streak of chromite

Answer any eight of the following in not less than a paragraph .Each question will have a weightage of 1.

17. Meander
18. V-shaped valley
19. Atoll
20. Pahoehoe
21. Focus
22. Chalcopryrite
23. Drainage patterns
24. Marine sediments
25. Deccan traps
26. Wind erosion

Explain any five of the following in not more than a page . Each question will have a weightage of 2.

27. Drainage pattern.
28. Aeolian land forms
- 29 Coral reef
- 30 Seismic Belt of India
- 31 Feldspar
32. Bauxite
33. Submarine topography. .

Answer long answer type question from the following. Each question will have a weightage of 4.

- 34 Write a brief account on the . Interior of the Earth
Or
35. How Glacial land forms are formed . Add a note on different glacial land forms
36. Give a brief account on the geological work of Groundwater
Or
37. What are the physical properties of minerals ? Add a note on different physical properties and how it helps to identify minerals

KANNUR UNIVERSITY
IV SEMESTER BSc. PROGRAMME
STREAM SCIENCE – CORE SUBJECT : GEOGRAPHY

COMPLEMENTARY SUBJECT : GEOLOGY

3 C 07 GEO- GEOLOGY

TIME 3 HOURS

Maximum weight 30

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. Concordant igneous intrusive bodies
2. A monomineralic igneous rock
3. A hypabyssal igneous rock
4. Texture of igneous rocks in which large crystals are embedded in a fine-grained matrix

5-8 will have a weightage of 1

5. Sedimentary rock with gravel-sized well-sorted pebbles
6. Sandstone is an example of sedimentary rock
7. Texture shown by a metamorphic rock with alternating light and dark bands
8. Metamorphosed limestone

9-12 will have a weightage of 1

9. Characteristic texture of basalt
10. Sedimentary structure produced due to changes in flow regimes of deposition/erosion
11. Typical mineral in charnockite
12. Metamorphic rock showing granulose texture

13-16 will have a weightage of 1

13. Lines joining points of equal altitude seen in topographical maps
14. The unconformity in which the older rock is igneous
15. The fold type in which the axial plane is horizontal
16. An example of primary geological structure

Answer any eight of the following in not less than a paragraph .Each question will have a weightage of 1.

- 17 Batholith
- 18 Graben
- 19 Factors of metamorphism
- 20 Graded bedding
- 21 Strike and dip
- 22 Synform
- 23 Types of lava
- 24 Geosyncline
- 25 Types of metamorphism
- 26 Map symbols

Explain any six of the following in not more than a page . Each question will have a weightage of 2 .

27. Igneous intrusives
28. Slate
29. Outcrops
30. Joints
31. Unconformity
32. Granite
33. Sandstone

Answer long answer type question from the following. Each question will have a weightage of 4.

34. Give an account on the Textures of igneous rocks.

Or

35. What are faults? Add a note on different types of faults.

36. What is sedimentation ? Give an account on sedimentary structures.

Or

37. How foliation and lineations are formed? What are different types

KANNUR UNIVERSITY
IV SEMESTER BSc. PROGRAMME

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COMPLEMENTARY SUBJECT : GEOLOGY

4 C 09 GEO- GEOLOGY

TIME 3 HOURS

Maximum weight 30

Answer all questions
Students will be graded based on their answers.

Answer the following

1-4 will have a weightage of 1

1. Branch of geology dealing with the study of strata and its relation to other strata
2. Who formulated the theory of Uniformitarianism?
3. Time unit higher in hierarchy to period in the Geological Time Scale
4. The principle of stratigraphy which states that younger strata are disposed above older strata

5-8 will have a weightage of 1

5. The youngest unit of Palaeozoic era in the Geological Time Scale
6. The oldest group of rocks in the Dharwar Craton of south India
7. The formation overlying the Trichnopoly formation in the Cretaceous formations of Trichnopoly
8. Age of Warkalli formation

9-12 will have a weightage of 1

9. The study of fossil spores and pollens
10. The microfossils important in petroleum exploration
11. The head shield of a trilobite
12. A sinistrally coiled gastropod

13-16 will have a weightage of 1

13. The relatively non-economic part of a mineral deposit
14. Ore mineral of magnesium used as a refractory
15. An example of an evaporite deposit
16. The process of formation of the black sands of the Kerala coast

Answer any six of the following in not less than a paragraph .Each question will have a weightage of 1.

17. What is meant by faunal succession?
18. Divisions of the Quaternary era
19. Petrification
20. Hydrothermal process
21. Geology of the mica deposits of Nellore
22. Ore
23. Contact metamorphism
24. Principle of Original Horizontality
25. Morphological features of brachiopods
26. Salient features of the petroleum deposits of India

Explain any six of the following in not more than a page . Each question will have a weightage of 2.

27. Order of superposition
28. Types of fossilization
29. Hydrothermal deposits
30. Neyveli lignite
31. Kolar Gold deposits
32. Evaporites
33. Tertiaries of Kerala

Answer long answer type question from the following. Each question will have a weightage of 4.

34. How Supergene sulphide enrichment concentrate ore deposits?
Or
35. Give an account on the mode of occurrence, geographic location and the geology of iron ore deposits of India.
36. What are trilobites? Add a note on the morphologic features.
Or
37. Give an account on the major geological divisions of India.

Sd/-
V.Gopinathan,
Chairman,BOS Geology(Cd)

KANNUR UNIVERSITY

(Abstract)

B.Sc Geology Programme under Choice based Credit Semester System-***Model Question Papers (V&VI Semesters)***-Implemented with effect from 2009 admission-Orders Issued.

ACADEMIC BRANCH

U.O.No.Acad/C2/3999/2007

Dated, K.U.Campus. P.O, 20-07-2010.

- Read: 1. U.O No.Acad/C2/3999/2007 dated 08-07-2009.
2. Minutes of the meeting of the Board of Studies in Geology (Cd) held on 27-05-2010.
3. Minutes of the meeting of the Faculty of Science held on 29-06-2010.
4. Letter dated 17-06-2010 from the Chairman, BOS in Geology (Cd).

ORDER

1.The Scheme and Syllabus of B.Sc Geology Core/Complementary/Open Courses and Model Question Papers(I-IV Semesters) under Choice based Credit Semester System were implemented in this University with effect from 2009 admission, vide paper read (1) above.

2. The Board of Studies in Geology(Cd),vide paper read (2) above, finalised the Model Question Papers for the rest of the Courses (V&VI Semesters) and the recommendation of the Board is endorsed by the Faculty of Science.

3.The Chairman, BOS in Geology (Cd) vide paper read (4), forwarded the Model Question Papers of V & VI Semester Examinations (Core/Open Courses) of B.Sc Geology Programme, finalised by the Board of Studies in Geology (Cd) for implementation with effect from 2009 admission.

4. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction ***to implement the Model Question Papers of V & VI Semester Examinations (Core/Open Courses) of B.Sc Geology Programme under CCSS with effect from 2009 admission,*** subject to report to the Academic Council.

5. The U.O read above stands modified to this extent.

6. Orders are issued accordingly.

7. The Model Question Papers of V & VI Semester examinations of B.Sc Geology Programme implemented with effect from 2009 admission are appended.

Sd/-

REGISTRAR

To:

The Principal, Govt College, Kasaragod.

Copy To:

1. The Examination Branch (through PA to CE)
- 2.The Chairman, BOS Geology (Cd)
3. PS to VC/PA to PVC/PA to Regr
4. DR/AR I Academic
5. Central Library
6. SF/DF/FC.

Forwarded/By Order

SECTION OFFICER