

LIBERAL COLLEGE LUWANGSANGBAM
DEPARTMENT OF GEOLOGY

PROGRAM OUTCOME OF B.SC. GEOLOGY

The B.SC Course program of Geology comprising 3 year integrated degree course consisting of six semesters, focused on earth science. The course involves the study of earth as a whole i.e. compositions, structure, history and other processes involved. The course covers environmental geology, Photogeology & remote sensing, computer application, and study of other natural resources like water resources, coal, petroleum, natural gas etc., their reserve and related problems. The course also includes fieldwork and exploration. By providing a comprehensive education in the field of Earth Sciences and scientific reasoning and acquiring knowledge in other subjects,

- Students will be able to correlate the knowledge of geology to other subjects so that clear scientific understanding can be achieved.
- Students can acquire experimental knowledge in collection of data, analyzing and interpretation of data.
- Job opportunity as Geologist in Mining, in oil exploration, and in Construction Company, Hydrogeologist and Oceanography etc.
- After pursuing B.Sc. Geology, students can also opt for higher studies like M.Sc. Geology, Applied Geology in Geophysics, Geochemistry, Palaeobotany, Gemology Petroleum Geology, Marine Geology, PhD courses etc.

Program Specific outcomes of B. Sc in Geology

Geology is a specific subject of Science with a multidisciplinary approach. Student doing graduation with B.Sc. in Geology will have the opportunity to -

- Understand the basic geological concept, principles and theories of different branches of geology.
- Design and perform Experiments in the labs to demonstrate the concepts, principles and theories learned in the classroom.
- Learn the scope of Geosciences in the field of disaster management, watershed management, water pollution, oil exploration, mining etc.
- Emphasize the importance of geology as the most important discipline for sustaining the existing industries and establishing new ones to create job opportunities at all levels of employment.

Course Outcome of B. Sc. in Geology

Semester 1: GEL-101

General geology, structural geology and geomorphology

General Geology:

Course Outcomes

After completing the course, the students are able to-

- Understand the Scope and Aim of Geology and relationship with other branches of Science.
- Understand the structure, composition, internal constitutions, origin and history of the Earth,
- Describe the origin of hydrosphere, biosphere and atmosphere.
- Discuss how different earth processes work and interact to form different landforms

and different minerals, rocks are resulted from various processes.

Structural Geology

Course Outcomes

After completing the course, the students are able to-

- Give an account of Structural geology and associated primary and secondary structures.
- Give classification and describe various types of folds and their recognizing criteria in the field.
- Describe faults based on geometrical pattern, genetic classification and its uses. Recognize faults in the fields and in geological maps.
- Give classification of joints and describe joints of tectonic origin.
- Out crop pattern, effect of structures in out crop.
- Describe morphometry of joints. Give geometric and genetic classification.
- Unconformity types and recognition of unconformity in the field.
- Give an account of Offlap and Overlap, Outlier and Inlier.

Geomorphology

Course Outcomes

After completing the course, the students are able to-

- Understand the various geologic processes that have been continuously operating until today which have shaped the Earth.
- Explain the geomorphic sub-divisions of India.
- Give concept of isostasy, continental drift and ocean floor spreading and plate tectonics. Explain the relation of diastrophic movements with plate tectonics and significance.
- Classify and describe landforms in a variety of environmental settings. Mitigating steps of environmental hazards earthquakes, landslide and floods.
- Acquire knowledge in the properties of light such as electromagnetic spectrum, Becke effect and double refraction.
- Acquire knowledge in handling petrological microscope and identifying different rock forming minerals by studying their optical properties in thin sections.
- Crystallography & Geochemistry:

Course outcome:

After completing the course, the students will be able to-

- Understand fundamental crystallographic concepts of crystal lattice, unit cell, morphology, internal structure, symmetry etc.
- Find specific tools for solution of a given crystallographic problems.
- Describe the composition of the Earth's and cosmos, periodic table, crystal bonding etc.
- Be able to describe Polymorphism, Pseudomorphism, solid solutions and isomorphism. Explain the geochemical classification of elements, chemical and mineralogical phase rule.

SEMESTER II

GEL-202 Descriptive Mineralogy, Optical Mineralogy, Crystallography and Geochemistry

Course Outcomes

After completing the course, the students are able to-

- Describe the concepts of Physical properties different group or species of minerals.
- Specific studies within mineralogy include the processes of mineral origin and formation, classification of minerals, their geographical distribution, as well as their utilization.

Optical mineralogy

Course Outcomes

After completing the course, the students are able to-

- Differentiate various parts of the polarizing microscope.

- Differentiate the optical properties of minerals.
- Give an account of magmatic differentiation, mixing and contamination changing magmatic melts on their way to the surface.
- Recognize the petrological properties and identification of different types of igneous rock.
- Sedimentary Petrology

Course Outcomes

After completing the course, the students are able to-

- Explain the sedimentation processes.
- Describe sedimentary structure, texture and sedimentary processes.
- Recognize the principal types of rocks in hand specimen and relate each type of rock to its genesis and the temporal dimension.
- Relate field observations of minerals and rocks to laboratory observations and to genetic theory, based on the textures.

SEMESTER III GEL-303

PETROLOGY- IGNEOUS

PETROLOGY, METAMORPHIC

PETROLOGY, SEDIMENTARY

PETROLOGY.

IGNEOUS PETROLOGY

Course Outcome:

After completing the course, the students would be able to-

- Describe the formation of igneous and acquaint about various processes responsible for the formation of different types of igneous rocks.
- Understand the forms, structure, and texture of igneous rocks interpreting crystallization history.
- Identify the connection between the natures of magmatic activity
- Explain Bowen reaction series, Phase rule the differences between open and closed systems (unicomponent and Bicomponent). Explain the physical process of magma formation by partial melting of the mantle

Metamorphic petrology

Course Outcomes

At the end of this course, students should be able to-

- Understand metamorphism, agents and types of metamorphism. In addition, effects of high temperature and pressure transforming affected rocks into metamorphic rocks.
- Understand the forms, structure, and texture of metamorphic rocks, interpreting metamorphism history and classification and nomenclature of metamorphic rocks.
- Explain concept of depth zones and grades of metamorphism and identification of common metamorphic rocks and their protoliths.

Sedimentary Petrology

Course Outcome

- After completing the course, the students will be able to-
- Explain various sedimentary processes involved for origin of Sediments, Textures of clastic and non-clastic sedimentary rocks and their significance.
- Explain the sedimentary processes resulting to the formation of different types of sedimentary rocks.
- Describe primary sedimentary structures and their uses in paleocurrent analysis and

granulometric analyses of sedimentary rocks.

- Describe concepts of sedimentary basins, provenance and facies. Tectonic framework of sedimentation.
- Understand petrographic details of important siliciclastic and carbonate rocks. Discuss role of heavy minerals in sedimentary provenance analyses

SEMESTER IV

GEL-404 Paleontology and Stratigraphy

Principals of Paleontology and Stratigraphy

Course Outcome

After completing the course, the students are able to-

- Correlate and relationship with the paleontology and stratigraphy of the particular area.
- Understand the fossilization and significance in correlation.
- Give knowledge on methods of collecting stratigraphic data using the stratigraphic contact.

Give stratigraphic column, distribution in India, fossil content and economic importance of a given geological formation and Clear views on the geologic time scale.

Paleontology

Course Outcome

After completing the course, the students are able to-

- Understand the application of fossils in establishing age of the rock unit and correlation with other area.
- Establish the idea of mineral and oil exploration.
- Identify and description of morphology of the fossils in laboratory works.
- Understand an account of life through ages and their evolutions.
- Demonstrate and understand the uses of fossils in solving geological problems: Paleoenvironments, relative age, paleo-ecology etc.

Indian Stratigraphy

Course Outcome

After completing the course, the students will be able to-

- Determine the depositional environment of different rock type and outcrop pattern.
- Understand the age and significance of depositional sequences.
- Be able to decipher the geological history of an area from a geological map.
- To explain various stratigraphic units and an account of criteria for stratigraphic correlation.
- Understand stratigraphic column, distribution in India, fossil content and economic importance of a given geological formation.

SEMESTER V

GEL (H) 505: Structural Geology, Tectonics And

Petrology Structural Geology and Tectonics:

Course Outcome

After completing the course, the students will be to-

- Get the knowledge of minor structures associated with fold and faults, mechanics of folding and faulting and their recognition in the field, classification of folds and faults.
- Understand the geometry and mechanics of the various structures that result through rock deformation.
- Determine possible causes of formation of structures and basic concept of stress and strain involved in structural geology, as well as the relation of structure with tectonics and give an account of foliation and lineation.

- Enable to use equipment and field tools to collect data for Laboratory analysis like stereographic projection and its uses in structural geology.
- Understand the dynamic nature of the Earth processes.
- Able to get knowledge on the tectonic framework of the Himalayas and Indo-Myanmar Ranges.

Igneous Petrology

Course Outcome

After completing the course, the students are able to-

- Understand the genesis, types and evolution of magma from different processes that takes place from origin to emplacement.
- Explain crystallization through phase rule of multicomponent magma system to equilibrium.
Give an outline of classification of igneous rocks commenting especially given by IUGS.
- Understand Forms and structures of igneous rocks. Types of texture and their significance interpreting cooling history.
- Explain the petrogenesis of common igneous rock types. Intrusive forms of igneous rocks and comment on their creation.
- Describe the petrographic and microscopic features of common igneous rocks

Metamorphic Petrology

Course Outcome

After completing the course, the students are able to explain-

- Phase rule and Goldsmith's mineralogical phase rule, chemical equilibrium in metamorphism and principles of metamorphic reactions.
- Concept of prograde and retrograde metamorphism. Structures and textures of metamorphic rocks and their importance in understanding metamorphic reaction principle.
- Metamorphic grades, facies and facies series and types of Metasomatism and their important products.
- Graphical representation of mineral assemblages-ACF, AKF, AFM diagrams.
- Metamorphic reaction principle in delineating mineral zones and progressive metamorphism.

Sedimentary Petrology

Course Outcome

- After completing the course, the students will be able to-
- Explain various sedimentary processes involved for origin of Sediments, Textures of clastic and non-clastic sedimentary rocks and their significance.
- Explain the sedimentary processes resulting to the formation of different types of sedimentary rocks.
- Describe primary sedimentary structures and their uses in paleocurrent analysis and granulometric analyses of sedimentary rocks.
- Describe concepts of sedimentary basins, provenance and facies. Tectonic framework of sedimentation.
- Understand petrographic details of important siliciclastic and carbonate rocks. Discuss role of heavy minerals in sedimentary provenance analyses.

**GEL-(H) ECONOMIC GEOLOGY, MINERAL GEOLOGY, FUEL GEOLOGY,
MINING AND EXPLORATION GEOLOGY**

ECONOMIC GEOLOGY

Course Outcome

After completing the course, the students will have the knowledge of-

- Ore and economic important minerals, classification, mineralization and deposits of ore.
- Different processes of mineralization of different ore forming minerals i.e. magmatic deposits, hydrothermal deposits etc.
- Are able to give an account of mechanical and residual concentration processes and resultant deposits.
To describe Oxidation and supergene sulphide enrichment processes, resultant deposits.
- Sedimentary and metamorphic processes of ore formation.
- Are able to give mode of occurrence, origin, compositions, distribution and economic importance of ore minerals found in Indian deposits.

2. Mineral Economics

Course outcome

- After completing the course, the students are able to-
- Get knowledge on important industrial minerals of India – cement, glass, and ceramics
- Understand in refractory, fertilizers and building stone.
- Explain the significance and role of minerals in the economy of India.
- Get knowledge in the mineral resources reserves in India and their classification

Fuel Geology

Course Outcome

After the completion of the course, the students are able to-

- Understand and learn about the basic concepts of Coal & Petroleum with respect to geology.
- Understand Origin of coal and stratigraphy of coal Measures and overview of Indian Coal deposits
- Describe the Basic concepts of Petroleum Geology and to study the process and the operations involved in Petroleum exploration
- The students will be appraised about the origin, migration and accumulation of petroleum
- It will also provide basic knowledge in Onshore and off shore distribution of petroliferous basins in India and brief knowledge of atomic fuels.

Mining and Exploration Geology

Course Outcome

After completing the course, the students are able to-

- Know essential relationship between geology and mining and different terms used in mining
- Understand in basic concepts of mineral exploration methods and techniques and the art and science of mining mineral resources.
- Detail knowledge in surface mining, alluvial mining, mineral sand, open pit cast mining and underground mining.
- The course envisages exposing the students to the topics such as geology in mining

industry, methods of exploration, Sampling Principle, Methods, estimation of reserves, Ore Dressing and Beneficiation

- This course tries to impart skills related to Geology in mining and enable him/her to perform duties of a geologist at the mining site.

SEMESTER VI

GEL (H) 608: GEOPHYSICS, ENGINEERING GEOLOGY AND HYDROLOGY

Course Outcome

Geophysics:

After completing the course, the students are able to-

- Understand the relationship between Geology and Geophysics
- Get the idea to explain the geological and geophysical data.

Have the knowledge of application of different type of geophysical method like gravity, magnetic, Electrical and seismic for exploration oil, gas, minerals and groundwater.

Engineering Geology

After the course, the students are able to

- Get the idea of difference between geology and engineering.
- Understanding the role of engineering geology in planning, design and Construction of major man - made structural features.
- Have the concepts of rock machines, soil, machines, site investigation and problems related to civil engineering projects.
- Get the knowledge of geotechnical investigation for dams, reservoirs and spillways, tunnels, underground caverns, bridges, highways and shorelines
- Engineering Geology
- After the completion of the course the students are able to.
- Have the knowledge of environmental consideration related to civil engineering projects.
- Understand the causes and preventive measures of geological hazard like landslide and earthquake.
- Understand and have the knowledge of slope stability studies, Earth-quake, zonation and a seismic design of structure.
- Get the idea of geotechnical engineering.

Hydrogeology

After the completion of the course, the students are able to.

- Have the knowledge of vertical distribution of groundwater, types of aquifers,
- Porosity and Permeability, springs and their formations.
- Origin of ground water and vertical distribution of groundwater, types of aquifers and water bearing properties of rock
- Further, get the idea of Dissolve constituent of ground water and salinization and Groundwater province in India.

GEL- (H) 609

ENVIRONMENTAL GEOLOGY, QUARTERNARY GEOLOGY, PHOTO GEOLOGY, REMOTE SENSING AND COMPUTER APPLICATION

ENVIRONMENTAL GEOLOGY

Course Outcome

- After the completing the course, the students are able to:
- Get the idea of Fundamental concept of Environmental Geology.

- Understand the Environmental Hazard Caused by Rivers, Landslide, Volcanoes, cyclone and management and pollution caused by solid waste disposal and radioactive waste. In addition, learn about the related measures to be taken up.
- Have the knowledge of Environmental impact of recycling resources and land- use planning in relating to engineering project.

Quaternary Geology

After the course of the students are able to-

Understand Quaternary Stratigraphy such as oxygen isotope stratigraphy, biostratigraphy and magneto-stratigraphy.

- Have the idea of neo-tectonics and active tectonics their application to natural hazard management.
- Have the knowledge of Quaternary dating method -Radiocarbon, Uranium series, Luminescence Amino acid and application of pollen, spores and phytoliths in Quaternary stratigraphy.
- Can understand the climate change strategy.

Photogeology and Remote Sensing

- After the course, the students are able to-
- Understand what is photogeology and principle of Remote Sensing and acquisition of aerial photograph.
- Understand the principle of stereoscopes and mirror stereoscopes, element of aerial photo interpretation and identification of different types of rocks.
- Have knowledge of interpretation of images like LANDSAT 1 to 7, SPOT IRS and basic idea of Radar Image.

Computer Application

After the course, the students are able to-

- Understands the fundamentals of computer operating systems, MS office packages
- Understanding in the application software in geological science software- Georient, ROCKPACK III and software for numerical calculations
- Acquire knowledge of using Map Info 8 and Arc GIS 9.2 for preparation of geological maps and lithology.

