Syllabus for Undergraduate Programme

Bachelor of Science in Geology

Manipur University, Canchipur
Imphal-795003
<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Paper Code</th>
<th>Title of Paper</th>
<th>Theor Exam</th>
<th>Pract Exam</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>Year I</td>
<td>First Semester</td>
<td>GL-101</td>
<td>General Geology, Structural Geology and Geomorphology</td>
<td>75</td>
<td>25</td>
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<td></td>
<td>Second Semester</td>
<td>GI-202</td>
<td>Descriptive and Optical Miineralogy, Crystallography and Geochemistry</td>
<td>75</td>
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<td>Third Semester</td>
<td>GL-303</td>
<td>Petrology</td>
<td>75</td>
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<td></td>
<td>Fourth Semester</td>
<td>GL-404</td>
<td>Palaeontology and Stratigraphy</td>
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<td>Year II</td>
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<td>GL(H)505</td>
<td>Structural Geology, Tectonics and Petrology</td>
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<td></td>
<td></td>
<td>GL(H)506</td>
<td>Economic And Fuel Geology, Mineral Economics and Mining Geology</td>
<td>100</td>
<td>NA</td>
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<td>GL(H)507 (P)</td>
<td>Structural and Economic Geology, Petrology and Field Work</td>
<td>NA</td>
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<td>Year III</td>
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<td>GL(H)608</td>
<td>Geophysics, Engineering Geology and Hydrogeology</td>
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<td>GI(H)609</td>
<td>Environmental &amp; Quaternary Geology, Photogeology, Remote Sensing and Computer Application</td>
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<td>GL(H)610(P)</td>
<td>Hydrogeology, Environmental &amp; Quaternary Geology, Photogeology, Remote Sensing, GIS, Seminar and Field Work</td>
<td>NA</td>
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Unit 1 General Geology  
25 Marks

Introduction to Geology, scope, Sub-discipline and relationship with other branches of science. Earth in the solar System and its origin, size, shape mass and density. Internal constitutions of the Earth. Convections in the earth’s core and production of magnetic field: Composition of earth in comparison to other bodies in the solar bodies in the solar system; Origin of hydrosphere and atmosphere, biosphere. Origin of oceans, continents and mountains. Age of the earth, Radioactivity and its application in determining the age of the Earth. Earthquaks- causes, geological effects and their measurement, distribution of earthquake belts. Volcanoes- types, cause and geological effects, distribution of volcanic belts; Relationship of earthquakes with volcanic belts. Weathering and erosion, Soil formation, profile and types, Geological time scale, Major events in the Earth’s history.

Unit 2 Structural Geology  
25 Marks

definition, description genesis and uses. Unconformity definition, type, recognition and utilities. Offlap and Overlap, outlier and inlier.

Unit 3 Geomorphology;


PRACTICALS; 25 Marks

Geomorphology: 8 marks

Study of important geomorphological models, identification and interpretation of geomorphic features from the topographical map. Identification of different drainage pattern. Reading topographical maps of the Survey of India., Concept of contour, scale and other topographic features. Preparation of slope maps. Preparation of longitudinal and cross valley and superimposed profiles. Recognition of regional erosion surfaces.

Structural Geology: 10 marks.


Field Work: 4 marks

Pertaining to study on primary sedimentary structures, secondary structures like folds, faults, unconformity, joints, etc. Measurement of strike direction dip direction and amount of dip of planar rock surfaces.

Viva voce: 3 Marks
Unit 1 Descriptive Mineralogy: 25 Marks

Minerals, definition and classification, common physical properties of minerals, classification of minerals and silicates. Mode of occurrence and genesis. Study of physical, chemical and optical properties of the following minerals (group/species) silica, feldspars, feldspathoids, micas, amphiboles, pyroxenes, olivines, garnet, beryl, topaz, tourmaline, zircon, apatite, fluorite, calcite, dolomite, gypsum, zeolite, corundum etc.

Unit 2 Optical Mineralogy: 25 Marks


Unit 3 Crystallography and Geochemistry 25 Marks

Crystallography 15 Marks

Geochemistry: 10 Marks
Definition and scope of the subject, composition of earth and cosmos, periodictable, crystal bonding. Co-ordination principle, radius ratio, polymorphism, pseudomorphism, solid solution and isomorphism, geo-chemical classification of elements, chemical and mineralogical phase rule

Practicals: 25 Marks
Descriptive Mineralogy 8 Marks
Study of physical properties and identification of minerals in hand specimen.
Determination of specific gravity of common minerals.

Optical Mineralogy 8 Marks
Use of polarizing microscope. Study of optical properties of important rock forming minerals.

Crystallography 8 marks
Study of elements of symmetry of representative crystals from each system.
Determination of interfacial angles.

Vica Voce 3 Marks

SEMESTER III

GL 303 PETROLOGY 75 marks

Unit 1 Igneous Petrology 25 Marks

Unit 2 Sedimentary Petrology: 25 Marks

Unit 3 Metamorphic Petrology 25 Marks
Introduction and scope of the subject. Definition of Metamorphism. Agents and types of metamorphism. Concept of depth xone and grade of metamorphism. Common metamorphic rocks and their protoliths such as slate, phyllite, schist, gness, hornfels,
marble, quartzite with some important Indian type rock. Stress and anti-stress minerals. Thermal and regional metamorphosis of argillaceous, calcareous sediments and basic and ultrabasic rocks.

Practicals: 25 Marks

Igneous Petrology 06 Marks

Study of petrological microscope. Megascopic and microspic study of the followin rock types Granite, syenite diorite, gabbro, peridotite rhyollite trachye, dolerite, basalt, dunite, serpentinite etc.

Metamorphic Petrology 06 Marks

Megascopic and microscopic study of the following rock types, slate, phyllite, schist, gnesiss, quartzite, marble.

Sedimentary Petrology: 04 marks

Study of sedimentary structures from hand specimens. Photographs and drawings. Megascopic and microscopio study of the followin rock types: Sandstone, shale, siltsone, limestone conglomerate and breccias.

Field work: 04 Marks

Pertaining to study on identification of different kinds of rocks in the field, collection of rock samples.

SEMESTER IV

GL 404 PALAEOLOGY AND STRATIGRAPHY 75 Marks

Unit 1 Principals of Palaeontology and Stratigraphy 25 Marks


Unit 2 Palaeontology 25 Marks

A detailed study of the morphology and geological distribution of the following phylum/classes/orders Brachiopda, mollusca (Classss- Pelecypoda and Gastropoda).

Unit Indian Stratigraphy

Connotation of the terms Archean, Dharwar, Cuddapah, Vindhyan, Gondwana. Study of the following supergroups of Indian Perecambrian rocks with special reference to lithology, tectonics and economic significance- Dharwar of Karnataka. Cuddapah of Andra Pradesh and Vindhyan of son valley, Singhbhum, Assam Plateau.Gondwana Supergroup and Tertianry of Manipur. Elements of facies concept in stratigraphy.

Practicals

Palaeontology; 12 Marks

Study of Morphological characters of about 30genera pertaining to Trilobita, Graptoloidia. Echinoidea, Anthozoa, Bivalves, Gastropods, Cephalopods, Brachipods, Mega foraminifers. Morphological study and identification of the following plant fossils- Glossopteris, Gangamopteris, Vertebraria, Nilssonia, etc; and trace fossils Skolithos verticalis, Thalasinoides paradoxicus, Ophiomorpha nodusa. Etc.

Stratigraphy 5 Marks

Preparation of Lithostratigraphic maps of India showing distribution of the following Dharwar Supergroup, Cuddapah Supergroup. Vidhyan supergroup, Gondwana. Tertiaries Sequences stratigraphic interpretation of measured lithocolumn of selected sections in Manipur.

Field Work: 5 Marks

Pertaining to Study on collection and identification of fossils, preparing lithocolumn for sequence stratigraphic interpretation.

Viva Voce: 3 marks
Unit-1 Economic Geology: 25 marks

Study of Indian deposits of the following ores and minerals with reference in their geology, mode occurrence, distribution uses of - magnetite, hematite, chromite, psilomelane, pyrolusite chalcopyrite, galena, sphalerite, native gold, magesite, bauxite, pyrite, diamond, muscovite, beryl, fluorite, gypsum, barite, halite, phosphorite, talc, kyanite, graphite, asbestos, monazite and corundum Precious and Semi-precious minerals.

Unit-2 Mineral Economics: 25 marks
Study of importanat industrial minerals of India with particular reference to the industries - cement, glass and ceramics, refractory, fertilizer and building stones, chemicals and gemstones. Significance of mineral in national economy. Demands, supply and substitute of minerals. Resources and reserves, their classification.

Unit-3 Fuel Geology: 35 marks
Fundamental of coal petrology, origin of Coal Stratigraphy of Coal Measure Overview of Indian coal deposit. Origin of petroleum and natural gas, surface indicator of oil shows migration of oil, petroleum reservoirs and various types of oil traps. Onshore and off-shore distribution of petrolierous basin in India. A brief study of atomic fuels.

Unit-4 Mining and Exploration Geology: 25 marks
Relation between geology and mining Different terms used in mining Concept of Mining methods - surface mining and alluvial mining, mineral sand, open pit and cast mining underground mining Fundamentals of geological, geochemical techniques employed in exploration of mineral deposits.
GL-(H) 507 (P): PRACTICAL 100 marks
Structural Geology: 25 marks


Igneous Petrology: 10 marks
Calculation of C.I.P.W. norm of oversaturated rocks. Calculation of Niggli value of rocks.

Metamorphic Petrology: 10 marks
Megascopic and microscopic study of metamorphic rocks - slate, phyllite, schist, gneiss, marble, quartzite, charnockite, hornfels, khondalite.
Sedimentary Petrology: 10 marks
Grain size analysis and preparation of histogram, frequency curves on the basis of grain size data. Presentation of palaeooccurent data. Examination of some common heavy minerals in grain mounts.

Economic Geology: 10 marks
Study of ore and economic minerals in hand specimens as detailed in the theory syllabus; Preparation of maps showing distribution of important metallic and nonmetallic deposits and important coal and oil fields of India.

Surveying: 10 marks
Using Plane Table, Prismsmatic Compass and Dumpy Level.

Field Work - visit to mine. 15 marks
Viva voce: 5 marks

SEMESTER-VI
GL-(H) 608: GEOPHYSICS, ENGINEERING GEOLOGY AND HYDROLOGY: 100 marks

UNIT-1 GEOPHYSICS: 25 marks
Inter relationship between geology and geophysics. Role of geological and geophysical data in explaining geodynamical features of the earth. General and Exploration geophysics- Different types of geophysical methods like: Gravity, Magnetic, Electrical and Seismic, their principles and applications. Physical properties of rocks and minerals giving anomalies leading to the idea of geophysical properties. Application of geophysical methods in oil, gas, minerals and groundwater explorations.

UNIT-2 ENGINEERING GEOLOGY: 25 marks
Geology vs Engineering. Role of Engineering geologists in planning, design and construction of major man-made structural features. Elementary concepts of
rock mechanics and rock engineering. Soil mechanics. Site investigation, characterization and problems related to civil engineering projects: foundation treatment, geological and geotechnical investigations for dams, reservoirs and spillways, tunnels, underground caverns, bridges, highways, shorelines.

**UNIT 3 ENGINEERING GEOLOGY:** 25 marks


**UNIT 4 HYDROGEOLOGY:** 25 marks

Definition of hydrogeology, geohydrology and hydrology. Hydrological cycle and groundwater in the hydrological cycle. Hydrological parameters—precipitation, evaporation, transpiration and infiltration: Origin and age of groundwater, Vertical distribution of groundwater; Types of aquifers; Water bearing properties of rocks—Porosity and Permeability; spring and their formations; Darcy’s law and its validity; Dissolved constituent of groundwater; Salinization of groundwater; Groundwater provinces of India.

**GL-(H) 609: ENVIRONMENTAL GEOLOGY, QUATERNARY GEOLOGY, PHOTOGEOLOGY, REMOTE SENSING AND COMPUTER APPLICATION:** 100 marks

**UNIT-1 ENVIRONMENTAL GEOLOGY:** 25 marks


**UNIT -2 QUATERNARY GEOLOGY:** 25 marks

UNIT-3 PHOTOGEOLOGY AND REMOTE SENSING: 25 marks


UNIT-4 COMPUTER APPLICATION: 25 marks


GL-(H) 610 (P): PRACTICALS: 100 marks

GEOPHYSICS: 20 marks

Preparation and interpretation of gravity, magnetic and electrical anomaly profiles and contour maps.

HYDROLOGY: 20 marks

Preparation and interpretation of water table maps. Plotting of groundwater provinces of India on a map of India.

PHOTOGEOLOGY, REMOTE SENSING AND GIS: 30 marks

Study of aerial photo-pairs using lens and mirror stereoscopes delineating geomorphic features (Aeolian, fluvial, glacial and coastal), rock types (igneous, sedimentary and metamorphic and unconsolidated sediments) and structural features (folds, faults, joints, caverns, lineaments). Recognition of various topographic features from satellite imageries. Calculation of scale from aerial photographs. Preparation of geological drainage maps from photographs.

FIELD WORK: 15 marks

Pertaining to observation of Quaternary deposits, river terraces, neotectonic and active tectonic evidences.

SEMINAR: 10 marks

VIVA VOCE: 5 marks