

# **SYLLABI AND COURSES OF STUDY IN GEOLOGY**

## **for the**

Examinations to be held in November 2014, 2015 & 2016)

### **Syllabi for B. Sc. Semester – I**

#### **Basic Concepts of Geology**

##### **UNIT-1**

- 1.1 Origin of Earth: Kant-Laplace, Jeans and Jeffrey's, Big Bang Theories
- 1.2 Geochronology and its application in Geology, Radioactive dating Methods: K-Ar, C-14 and U-Pb methods.
- 1.3 Earthquakes: Earthquake belts of the world, seismic zones of India. earthquake predictions
- 1.4 Volcanoes: Classification of volcanoes, volcanic landforms and distribution of volcanoes
- 1.5 Weathering: Controlling factors of weathering, Types of weathering. Karst topography: Erosional and depositional features of Karst topography.

##### **UNIT-2**

- 2.1 Fluvial Process: River profile, Stream types, Drainage pattern, erosional and depositional features produced by river.
- 2.2 Aeolian process: Processes of Aeolian erosion, erosional and depositional features produced by wind.
- 2.3 Glaciers: Their types, erosional and depositional features produced by glaciers, glaciations through geological ages.
- 2.4 Unconformities: Formation, types and recognition in the field.
- 2.5 Folds and faults: Morphology and Classification.

##### **UNIT-3**

- 3.1 Minerals: classification of silicate minerals based on silicate structure.
- 3.2 The significance of physical properties and their utility in identification of minerals, MOhs scale of hardness.
- 3.3 Physical properties and chemical composition of Feldspar and Mica Groups.
- 3.4 Physical properties and chemical composition of Amphibole and Pyroxene Groups.
- 3.5 Physical properties and chemical composition of Garnet and Olivine Groups.

##### **UNIT-4**

- 4.1 Crystal structure, morphology of crystals division of different crystals into normal crystal systems

- 4.2 Crystallographic axes and axial angles, notation of faces on parameters of Weiss and Miller indices.
- 4.3 Crystal Symmetry and forms of Normal classes of Cubic, tetragonal and Hexagonal Systems
- 4.4 Crystal Symmetry and forms of Normal classes of Orthorhombic, Monoclinic and Triclinic systems
- 4.5 Twinning: Twin crystals, Twin axis, twin planes, composition planes, Twin laws and different types of twinning

## UNIT-5

- 5.1 Petrological microscope: construction and working.
- 5.2 Polarized light, Pleochroism, Birefringence, Interference colours.
- 5.3 Extinction and its types, extinction angle, isotropism and anisotropism
- 5.4 Reflection, double refraction, Nicol prism and its construction and function.
- 5.5 Refraction. Refractive index: methods of its determination, critical angle.

**Note 1:** There shall be one theory paper of 100 marks (80 marks written external examination and 20 marks internal assessment). Theory paper shall be of three hours duration.

**Note 2:** In case of regular students, internal assessment received from the colleges will be added to the marks obtained by them in the University examination and in case of private candidates, marks obtained by them in the University examination shall be increased proportionately in accordance with the relevant Statues / Regulations of the university.

### **Note for Paper setting:**

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

### Books recommended

- |                           |                                      |
|---------------------------|--------------------------------------|
| 1. A. Holmes              | -Principles of Physical Geology      |
| 2. Thornburry             | -Geomorphology                       |
| 3. Deer, Hawie & Zuessman | -Rock forming minerals               |
| 4. Bagley, P.C            | -Structure and Tectonics             |
| 5. Gosh, S.K              | -Structural Geology                  |
| 6. Dana, E.S              | -A text book of mineralogy           |
| 7. Kerr,P.G               | -Optical mineralogy                  |
| 8. Condie                 | -Plate tectonics & crustal evolution |

**Practicals**

The practical component shall be of 50 marks (internal) comprising of continuous class assessment, practical test and attendance. The breakup of the marks shall be as follows: 20 marks as continuous class assessment in the practicals, 15 marks written examination (four hours duration) at the end of the semester, 5 marks Viva-voce and 10 marks for practical attendance (to be allotted as per statutes)

1. Study of physical properties and chemical composition of rock forming minerals.
2. Study of optical properties of silicate minerals under microscope: Quartz, albite, microcline, orthoclase, muscovite, biotite, tourmaline, hornblende, augite, olivine.
3. Study of symmetry elements and forms of normal classes of crystal systems.
4. Viva-voce.

# **SYLLABI AND COURSES OF STUDY IN GEOLOGY for the**

(Examinations to be held in April 2015, 2016 & 2017)

## **Syllabi for B. Sc. Semester –II**

### **Basics of Petrology**

#### **UNIT-1**

- 1.1 Igneous rocks-definition, classification, tabular and normative.
- 1.2 Origin of igneous rocks, magmatic differentiation and assimilation.
- 1.3 Magma – definition and its composition, Bowen’s reaction series.
- 1.4 Textures and structure of igneous rocks.
- 1.5 Description of important igneous rocks, i.e Granite, Rhyolite, Basalt, Gabbro, Syenite, Trachyte, Pegmatite and Peridotite.

#### **UNIT-2**

- 2.1 Felsic, femic, mafic and salic minerals, colour index and its significance.
- 2.2 Chemical composition of minerals and elementary idea about phase rule.
- 2.3 Use of phase rule in two and three component Silicate systems, crystallization of albite-anorthite, plagioclase series, di-ab- an system.
- 2.4 Mineralogical characteristics of acid and alkaline igneous rocks.
- 2.5 Mineralogical characteristics of basic and ultramafic igneous rocks.

#### **UNIT-3**

- 3.1 Sedimentary rocks- origin, transportation and deposition.
- 3.2 Diagenesis: lithification, compaction, cementation, neomorphism
- 3.3 Classification of clastic rocks.
- 3.4 Classification of non –clastic rocks
- 3.5 Primary and secondary structures in sedimentary rocks

#### **UNIT-4**

- 4.1 Textures of sedimentary rocks.
- 4.2 Structures of Sedimentary rocks.
- 4.3 Concept of Sedimentary facies.
- 4.4 Depositional environments of sedimentary rocks.
- 4.5 Description of important sedimentary rocks i.e. sandstone, shale, limestone, conglomerate and breccia.

## UNIT-5

- 5.1 Metamorphism, agents and types.
- 5.2 Textures and structures of metamorphic rocks.
- 5.3 Concept of ACF & AKF diagrams.
- 5.4 Metamorphic facies- greenstone, granulite and eclogite facies.
- 5.5 Description of important metamorphic rocks (Slate, Phyllite, Schist, Gneiss, Quartzite and marble).

**Note 1:** There shall be one theory paper of 100 marks (80 marks written external examination and 20 marks internal assessment) Theory paper shall be of three hours duration.

**Note 2:** In case of regular students, internal assessment received from the colleges will be added to the marks obtained by them in the University examination and in case of private candidates, marks obtained by them in the University examination shall be increased proportionately in accordance with the relevant Statutes / Regulations of the university.

### **Note for Paper setting**

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

### Books recommended

- |                                  |  |
|----------------------------------|--|
| 1. H.H.Reed                      | -Rutley's Mineralogy                   |
| 2. Tyrrel                        | -Principles of Petrology               |
| 3. Deer, Hawie & Zuessman        | -Rock forming Minerals                 |
| 4. Myron,G                       | -Igneous & Metamorphic Petrology       |
| 5. Turner                        | -Metamorphic Petrology                 |
| 6. Dana, E.S                     | -A text book of mineralogy             |
| 7. Wilson                        | -Carbonate Rocks in Geologic History   |
| 8. Petijohn                      | -Sedimentary Rocks                     |
| 9. Reineck & Singh, I.B          | -Depositional Sedimentary Environments |
| 10. Friedman, Gorale & Sanders - | Principles of Sedimentology            |

### **Practicals**

The practical component shall be of 50 marks (internal) comprising of continuous class assessment, practical test and attendance. The breakup of the marks shall be as follows: 15 marks as continuous class assessment in the practicals, 10 marks written examination (four hours duration) at the end of the semester, 5 marks viva-voce and 10 marks for practical attendance (to be allotted as per statutes), 10 marks for field work and field report.

1. Megascopic study of Igneous, metamorphic and sedimentary rock specimens.
2. Thin section study of common rock forming minerals
3. Field work and report (Compulsory)
4. Viva-voce.

**GEOLOGY**  
**SEMESTER III**

(Examinations to be held in 2015, 2016 & 2017)

Course No. **GE-301 (Theory)**

**Title: Earth's Resources**

Duration of Exam.: **3 Hrs**

Max. Marks: **100 marks**

Credits : **4**

External Exam.: **80 marks**

Int. Ass.: **20 marks**

**UNIT-1**

- 1.1 Natural resources and their classification, in-exhaustible (sunlight, wind, water, sea waves) –an alternative source of energy
- 1.2 Mineral resources and their potential in India
- 1.3 Non renewable resources, conservation of fossil fuels.
- 1.4 Environmental implications of exploitation of mineral resources.
- 1.5 Concept of shale gas resource and its future prospect in India

**UNIT-2**

- 2.1 Concept of ore-Ore mineral, tenor and gangue, Factors controlling mineral availability
- 2.2 Classifications of ore deposits
- 2.3 Distribution of mineral deposits in Time and Space, Metallogenic provinces and Epochs.
- 2.4 Supergene enrichment process of ore formation.
- 2.5 Sedimentary ore deposits and their distribution in India

**UNIT-3**

- 3.1 Magmatism as ore forming process, magmatic ore deposits, early and late magmatic ore deposits.
- 3.2 Sedimentation as a process of ore formation, Placer deposits.
- 3.3 Metamorphism as ore forming process, metamorphic and metamorphosed mineral deposits.
- 3.4 Hydrothermal solutions, Classification of hydrothermal ore deposits.
- 3.5 Weathering as ore forming process, residual ore deposits.

**UNIT-4**

- 4.1 Geological setting, mode of occurrences and distribution of Fe, Cu, Pb & Zn ore deposits in India.
- 4.2 Coal:-Composition, ranks of coal, origin and distribution in India.
- 4.3 Petroleum: Origin, distribution in India.
- 4.4 Fertilizer minerals: Mode of occurrence and distribution in India
- 4.5 Cement industry minerals: Mode of occurrences and distribution in India.

## UNIT-5

- 5.1 Refractory minerals: Properties, mode of occurrences and their distribution in India.
- 5.2 Gemstones: Properties, mode of occurrences and their distribution in India
- 5.3 Abrasive minerals-Classifications and distribution in India.
- 5.4 Radioactive minerals-properties, occurrences and their distribution in India.
- 5.5 Mineral wealth of J&K, metallic, non-metallic, precious stones, building stones and coal.

### Note for Paper setting:

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

### Books recommended:

1. Chatterjee ..... Mineral Economics.
2. Sinha & Rai ..... Mineral Economics
3. N.L.Sharma ..... Geology of coal & Indian coal fields.
4. Krishnaswamy ..... Mineral deposits of India.
5. Gokhle & Rao ..... Ore deposits of India.
6. Prasad ..... Ore deposits of India.

### Internal assessment of 20 marks shall be distributed as under:

- i. Class test 10 marks
- ii. Two written assignments 10 marks (05 marks each)

## **GEOLOGY**

Course No. <b>GE-301 ( Practical)</b>	Title:	<b>Practical</b>
Duration of Exam. <b>4 Hrs</b>	Max. Marks:	<b>50 marks</b>
	External Exam.:	<b>25 marks</b>
	Int. Ass.	<b>25 marks</b>

Int. Ass. 25 marks in B.Sc. breakup as under

- |   |                 |
|---|-----------------|
| i) Continuous Class<br>assessment in practical    | <b>10 marks</b> |
| ii) Written Examination at<br>The end of Semester | <b>10 marks</b> |
| iii) Attendance                                   | <b>05 marks</b> |

External Examination 25 marks in B.Sc. breakup as under

- |                                  |                 |
|----------------------------------|-----------------|
| i) Written External Exam. (4hrs) | <b>10 marks</b> |
| ii) Field Report                 | <b>10 marks</b> |
| iii) Viva- voce                  | <b>05 marks</b> |

1. Study of physical properties and chemical composition of Ore minerals
2. Study of abrasive minerals
3. Study of various types of coal samples
4. Viva-Voce.

**GEOLOGY**  
**SEMESTER IV**

(Examinations to be held in 2015, 2016 & 2017)

Course No. **GE-401 (Theory)**

**Title: Palaeontology and Stratigraphy**

Duration of Exam.: **3 Hrs**

Max. Marks: **100 marks**

Credits : **4**

External Exam.: **80 marks**

Int. Ass.: **20 marks**

**UNIT-1**

- 1.1 Fossil-definition, conditions and mode of preservation, types, their significance.
- 1.2 Origin of life and life through ages.
- 1.3 Morphology and geological distribution of Nautiloidea
- 1.4 Geological distribution and morphological characteristics of Ammonoidea
- 1.5 Geological distribution of graptolites and their importance

**UNIT-2**

- 2.1 Morphology and geological distribution of Pelecypoda and Gastropoda.
- 2.2 Geological distribution and important morphological features of Brachiopoda
- 2.3 Morphological characters and geological distribution of Echinodermata.
- 2.4 Geological distribution and important morphological characters of trilobita
- 2.5 Emergence and Importance of Ostracods

**UNIT-3**

- 3.1 An introduction to Vertebrate palaeontology: Evolutionary history of Horse and Elephant.
- 3.2 A brief study of reptiles with special reference to dinosaurs.
- 3.3 Gondwana Stratigraphy: litho and biostratigraphic classification, climatic variations and economic importance.
- 3.4 Important characteristics of Gondwana plants: Glossopteris, Gangmopteris, Vertebraria, Thinfeldia, Sigillaria, Nilsonia, Ptylophylum, Lepidodendron, Calamites, Schizoneura.
- 3.5 Microflora: Introduction, Important forms of microflora

**UNIT-4**

- 4.1 Principles of Stratigraphy and the criteria for correlation of strata.
- 4.2 Standard stratigraphic time scale. Concept of litho-bio-chronostratigraphy.
- 4.3 Physical and structural subdivisions of Indian subcontinent and their characteristics..

- 4.4 Brief description of Archean and Proterozoic successions of India : Dharwar, Aravallies, Cuddapha,
- 4.5 Distribution and lithostratigraphic classification of Vindhyan, Salkhala, Dogra/Shimla States.

## **UNIT-5**

- 5.1 Litho and biostratigraphic classification of Palaeozoic sequence of Kashmir and Spiti.
- 5.2 Stratigraphy of the Jurassic of Kutch and Cretaceous of Trichnopoly.
- 5.3 Deccan lava flows-distribution and stratigraphic position.
- 5.4 Litho and biostratigraphic classification of Siwalik sequence.
- 5.5 Lithology and age of Karewas of Kashmir

### **Note for Paper setting:**

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

### **Books recommended:**

H. Woods .....	Invertebrate Palaeontology
R.N.Black .....	The elements of Palaeontology
Davis & Stubblefield .....	An introduction to Palaeontology
Ravinder Kumar .....	Fundamentals of Historical Geology
D.N.Wadia .....	Geology of India
M.S.Krishnen .....	Geology of India & Burma
Weller .....	Stratigraphic Principles and Practice
Colbert .....	Evolution of Vertebrates
Shukla .....	Essentials of Palaeobotany

### **Internal assessment of 20 marks shall be distributed as under:**

- i. Class test 10 marks**
- ii. Two written assignments 10 marks (05 marks each)**

## **GEOLOGY**

Course No. <b>GE-401</b>	Title:	<b>Practical</b>
Duration of Exam. <b>4 Hrs</b>	Max. Marks:	<b>50 marks</b>
	Practical Exam.:	<b>25 marks</b>
	Int. Ass.	<b>25 marks</b>

Int. Ass. 25 marks in B.Sc. breakup as under

- i) Continuous Class  
assessment in practical **10 marks**
- i) Written Examination at  
The end of Semester **10 marks**
- ii) Attendance **05 marks**

External Examination 25 marks in B.Sc. breakup as under

- i) Written External Exam. (4hrs) **10 marks**
- ii) Field Report **10 marks**
- iii) Viva- voce **05 marks**

1. Study of invertebrate fossils.
2. Study of plant fossils
3. Drawing of geological sections, writing of geological history and completion of out crops in the given geological maps.
4. Field work and its report (Compulsory)
5. Viva-Voce.

**GEOLOGY**  
**SEMESTER V**

(Examinations to be held in 2015, 2016 & 2017)

Course No. **GE-501 (Theory)**

**Title: Dynamics of Earth**

Duration of Exam.: **3 Hrs**

Max. Marks: **100 marks**

Credits : **4**

External Exam.: **80 marks**

Int. Ass.: **20 marks**

**UNIT-1**

- 1.1 Seismic waves and their application in the study of interior of Earth, structure and chemical composition of various layers of the earth.
- 1.2 Geophysical parameters of earth, gravity, magnetism and heat flow.
- 1.3 Application of geophysics in understanding the dynamics of earth.
- 1.4 Detailed idea of isostasy and its various theories.
- 1.5 Origin of main mountain chains of the world (Rockies, Andes, Urals, Alps, Himalaya).

**UNIT -2**

- 2.1 Continental drift and its evidences; Evidences of sea-floor spreading; concept of Polar wandering.
- 2.2 Organic and epeirogenic phases and brief description of evolution of ocean and continents.
- 2.3 Continent – Continent Collision Tectonics; Himalaya
- 2.4 Geometry and mechanism of plate motion tectonics of continental margins and continental shelves.
- 2.5 Origin and distribution of Island Arcs, Mid-Oceanic Ridge and Trenches.

**UNIT-3**

- 3.1 Relationship between orogeny, magmatization and metamorphism.
- 3.2 Sedimentary structures used as index of facing.
- 3.3 Relationship between joints and folds.
- 3.4 Foliation: Definition, origin and its relationship with major structures.
- 3.5 Geological significances of unconformity and foliation.

**UNIT-4**

- 4.1 Joints; Definitions; Genesis; Classification and Significance.
- 4.2 Lineation: Definition; Types; Origin and its relationship with major structures.

- 4.3 Mechanics of faulting, distinguishing of faults from unconformities.
- 4.4 Vertical and horizontal tectonics: Origin of grabbens, horsts, window, klippe & nappes.
- 4.5 Mechanical aspects of folding.

#### **UNIT-5**

- 5.1 Recognition of the folds in the field
- 5.2 Boundin structures: geometry and types.
- 5.3 Equal area and stereographic projections, plotting of structural data.
- 5.4 Relationship between folds and foliations.
- 5.5 Response of rocks to stress change: elastic, plastic and brittle behaviour of the rocks.

#### **Note for Paper setting:**

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

#### **Books recommended:**

- 1. A.Home: Principles of Physical Geology
- 2. A.M.Pat Wardhan: The Dynamics of Earth System
- 3. Valdiya K.S.: Dynamic Himalaya
- 4. M.P.Billings: Structural Geology
- 5. Ghosh S.K Structural Geology Fundamentals

#### **Internal assessment of 20 marks shall be distributed as under:**

- i. Class test 10 marks**
- ii. Two written assignments 10 marks (05 marks each)**

## **GEOLOGY**

Course No. <b>GE-501</b>	Title:	<b>Practical</b>
Duration of Exam. <b>4 Hrs</b>	Max. Marks:	<b>50 marks</b>
	Practical Exam.:	<b>25 marks</b>
	Int. Ass.	<b>25 marks</b>

Int. Ass. 25 marks in B.Sc. breakup as under

- i) Continuous Class assessment in practical **10 marks**
- ii) Written Examination at The end of Semester **10 marks**
- iii) Attendance **05 marks**

External Examination 25 marks in B.Sc. breakup as under

- i) Written External Exam. (4hrs) **10 marks**
- ii) Field Report **10 marks**
- iii) Viva- voce **05 marks**

1. Determination of true thickness of beds in different situations
2. Relative age determination of joints.
3. Viva-voce.

**GEOLOGY**  
**SEMESTER VI**

(Examinations to be held in 2015, 2016 & 2017)

Course No. **GE-601 (Theory)**

**Title: Environment and Applied Geology**

Duration of Exam.: **3 Hrs**

Max. Marks: **100 marks**

Credits : **4**

External Exam.: **80 marks**

Int. Ass.: **20 marks**

**UNIT-1**

- 1.1 Environmental Geology: Concept: Definition. Concept of ecosystem and its types
- 1.2 Mutual interrelationship and interaction among atmosphere, hydrosphere, lithosphere and biosphere.
- 1.3 River erosion and its control. Floods; causes and management of floods.
- 1.4 Environmental changes due to influence of nature dominated system.
- 1.5 Engineering Geology and its impact on natural environment, geological conditions and environmental condition in the location of the Dams, Reservoirs and Tunnels.

**UNIT-2**

- 2.1 Introduction of Remote Sensing and GIS.
- 2.2 Introduction of aerial photography and its applicability in geosciences.
- 2.3 Groundwater: definition; water table; hydrologic cycle; Piezometric surface; perched water.
- 2.4 Vertical distribution of groundwater, Hydrological properties of rocks, Permeability and porosity
- 2.5 Aquifer: confined and unconfined; coastal aquifers.

**UNIT-3**

- 3.1 Coal: definition; origin; ranks of coal: Distribution of Indian coal deposits.
- 3.2 Hydrocarbons: Source rocks, Reservoir rocks and migration of oil and natural gas.
- 3.3 Oil traps:- Structural, Stratigraphic and Combination traps.
- 3.4 On-shore and off-shore distribution of petroliferous basins of India.
- 3.5 Radioactive minerals: Measurement of radioactivity; Indian distribution.

**UNIT-4**

- 4.1 Geophysical prospecting methods: Seismic method, Resistivity method, magnetic method and gravity method.

- 4.2 Geochemical and Geobotanical prospecting methods.
- 4.3 Drilling:- types of drilling methods.
- 4.4 Geophysical logging methods: Definition, Radioactive logging, Temperature logging, sonic logging, litho- logging, Resistivity logging, Self potential logging.
- 4.5 Sampling methods and assaying.

## **UNIT-5**

- 5.1 Mineral Economics:- Strategic, Essential and Critical minerals.
- 5.2 Classification of mineral resources.
- 5.3 National mineral policy.
- 5.4 Mineral concession rules, mining legislation.
- 5.5 Marine mineral resources.

### **Note for Paper setting:**

The question paper will contain two questions from each unit (Total ten Questions) and the examinees will be required to answer any five questions selecting one question from each unit.

### **Books recommended:**

- |    |                        |  |
|----|------------------------|--|
| 1. | Valdiya K.S:           | Environmental Geology                          |
| 2. | E.Bryant :             | Natural Hazards                                |
| 3. | Patwardhan A.M:        | The Dynamic Earth System                       |
| 4. | R.C Ray:               | Aerial Photographs in geologic interpretation. |
| 5. | S.N Pandey:            | Principles and Applications of photography.    |
| 6. | Arogyaswami R.P.N.     | Course in Mining geology.                      |
| 7. | B.Mason and C.B Moore. | Introduction to Geochemistry.                  |
| 8. | A.I. Levenson          | Geology of Petroleum.                          |

### **Internal assessment of 20 marks shall be distributed as under:**

- i. Class test 10 marks**
- ii. Two written assignments 10 marks (05 marks each)**

## **GEOLOGY**

Course No. <b>GE-601</b>	Title:	<b>Practical</b>
Duration of Exam. <b>4 Hrs</b>	Max. Marks:	<b>50 marks</b>
	Practical Exam.:	<b>25 marks</b>
	Int. Ass.	<b>25 marks</b>

Int. Ass. 25 marks in B.Sc. breakup as under

- i) Continuous Class assessment in practical **10 marks**
- ii) Written Examination at The end of Semester **10 marks**
- iii) Attendance **05 marks**

External Examination 25 marks in B.Sc. breakup as under

- i) Written External Exam. (4hrs) **10 marks**
- ii) Field Report **10 marks**
- iii) Viva- voce **05 marks**

1. Megascopic study of igneous, metamorphic and sedimentary rock specimens
2. Microscopic study of rocks: Granite, Gabbro, Basalt, Sandstone, limestone, slate and schist.
3. Field work and field report (Compulsory)
4. Viva-voce.