

**UPDATED SCHEME OF EXAMS. & SYLLABI FOR B.SC. GEOLOGY**

**WITH 20% INTERNAL ASSESSMENT**

**INSTRUCTORS TO PAPER SETTERS  
(B.Sc. Geology - Semester I to Semester VI)**

1. Each theory paper comprises 4 units.
2. Nine questions will be set in all out of which the examinees will attempt only Five questions. First question will be compulsory; it will be covering the entire syllabus, and be of short answer type. Out of remaining 8 questions the examinees will answer one question from each unit.
3. The examiner will set Two questions from each of the four units out of which one question shall be of short notes.

## KURUKSHETRA UNIVERSITY, KURUKSHETRA

B.Sc - GEOLOGY three Year COURSE under **Semester System**

Scheme of examinations for I, II, III Years with Detailed Syllabus **(w.e.f. Session 2011-12)**

S. No.	Code Paper	Nomenclature	Marks			Time
			Theory/ Practical	Internal	Total	
		<b>B.Sc I Year (Semester 1 &amp; 2)</b>				
1.	U-GEOL- 101	Physical Geology and Geomorphology	40	10	50	3 hrs
2.	U-GEOL-102	Structural Geology	40	10	50	3 hrs
3.	U-GEOL-201	Crystallography & mineral optics	40	10	50	3 hrs
	U-GEOL-202	Mineralogy	40	10	50	3 hrs
4.	U-GEOL-PR-203	Practical  (Based on U-GEOL 101,102, 201 & 202)	80	20	100	3 hrs
		<b>B.Sc II Year (Semester 3 &amp; 4)</b>				
5.	U-GEOL-301	Palaeontology	40	10	50	3 hrs
6.	U-GEOL-302	Stratigraphy	40	10	50	3 hrs
7.	U-GEOL-401	Petrology I	40	10	50	3 hrs
8.	U-GEOL-402	Petrology II	40	10	50	3 hrs
9.	U-GEOL-PR-403	Practical  (Based on 301,302,401&402)	80	20	100	3 hrs
		<b>B.Sc.-III Year (Semester 5 &amp; 6)</b>				

10.	U-GEOL-501	Economic Geology	40	10	50	3 hrs
11.	U-GEOL-502	Exploration Geology & Remote Sensing	40	10	50	3 hrs
12.	U-GEOL-601	Engineering Geology & Mining Geology	40	10	50	3 hrs
13.	U-GEOL-602	Hydrogeology and Environmental Geology	40	10	50	3 hrs
14.	U-GEOL-PR-603	Practical (Based on 501, 502, 601 & 602)	80	20	100	3 hrs

Note: The revised scheme of B.Sc. geology with 20% internal assessment will be effective from session 2011-12 for I & II semester, 2012-13 for III & IV semester and 2013-14 for V & VI semesters.

## **B.Sc IST YEAR (GEOLOGY) I SEMESTER**

### **U GEOL-101 Physical Geology & Geomorphology**

**Max. Marks: 40+10\***

**Time: 3 hrs**

**\*Internal**

#### **Unit I**

Role of Geology to the mankind. Geology and its branches - their interrelationship. Origin of Earth and Solar System. Shape and size of earth; its relief features & Interior, meteorites and age of earth.

#### **Unit II**

Volcanoes and earthquakes; Elementary idea of isostasy, continental drifting, sea floor spreading and plate tectonics; geosynclines, rift valleys and island arcs.

#### **Unit III**

Surface Geological processes – Exogenic & Endogenic, Orogenic & Epiorogenic processes. Weathering and mass wasting; Types of weathering.

#### **Unit IV**

Erosional and depositional features of fluvial, arid, glacial, coastal and lacustrine geomorphic cycles. Cycles concept in geomorphology, peneplanation, uplift and rejuvenation.

#### **BOOKS RECOMMENDED:**

Principles of Physical Geology	A. Holmes
Principle of Geomorphology	W.D. Thornbury
Geomorphology	V.K. Sharma
Plate Tectonics and crustal Evolution	K.C. Condy
Aspects of tectonics	K.S. Valdiya
Essentials of Earth Science	Kelvin

**B.Sc Ist year (GEOLOGY) I SEMESTER**

**U GEOL - 102 Structural Geology**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

**\*Internal**

**Unit I**

Elements of structural geology-attitude of beds, strike and dip. Deformation of rocks - force, stress, strain and rupture. Elastic and plastic deformations

**Unit II**

Folds, their morphology, genetic and geometric classification. Recognition of folds on maps and in the field.

**Unit III**

Faults, their geometric and genetic classification; Recognition of faults on maps and in the field.

**Unit IV**

Joints and their classification. Unconformity, its types and recognition in the field & maps.

**BOOKS RECOMMENDED:**

Structural Geology

M.P. Billing

Foundation of structural geology

R.G. Park

Principles of structural geology

G.M. Mevin

**B.Sc I Year (GEOLOGY) II SEMESTER**  
**U GEOL - 201 Crystallography and Mineral optics**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

**\* Internal**

**Unit I**

Crystals and their structures - forms, faces, edges, solid angles Elements of symmetry - axes, planes & center; parameter, indices and notations.

**Unit II**

Study of crystal forms of normal classes of all seven crystal systems. Twinning, its types with examples.

**Unit III**

Principles of optics, reflection, refraction, double refraction, polarization of light, Nicol prism, petrological microscope. Use of optical accessories - mica plate, gypsum plates and quartz wedge.

**Unit IV**

Scheme of study of important optical properties under plane polarized light and crossed nicols.

**BOOKS RECOMMENDED**

Rutley's Elements of Mineralogy	H.H. Read
Dana's Text book of Mineralogy	W.E. Ford
Mineralogy	Berry & Mason
Mineralogy for students	M.I. Batty
Optical Mineralogy	E.E. Wahlstrom
Optical Mineralogy	F.F. Kerr
Elements of Optical Mineralogy	A.N. Winchell

## **B.Sc I Year (GEOLOGY) II SEMESTER**

### **U GEOL – 202 \_Mineralogy**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

\* **Internal**

#### **Unit I**

Mineral- its definition and scope. Types of bondings, Isomorphism, polymorphism, pseudomorphism. Solid solution and exsolutions..  
Classification of minerals. Physical and chemical properties of minerals.

#### **Unit II**

Study of physical, chemical, optical properties and economic uses of quartz & other forms of silica, feldspars and felspathoids group of minerals.

#### **Unit III.**

Study of physical, chemical, optical properties and economic uses of amphibole, pyroxene, mica, clay, olivine, and garnet group of important minerals.

#### **Unit IV**

Study of physical, chemical, optical properties and economic uses of zeolite, kyanite, sillimanite, epidote, fluorite, tourmaline, beryl, zircon, sphene, monazite, corundum and diamond.

#### **BOOKS RECOMMENDED**

Rutley's Elements of Mineralogy	H.H. Read
Dana's Text book of Mineralogy	W.E. Ford
Mineralogy	Berry & Mason
Mineralogy for students	M.I. Batty
Optical Mineralogy	E.E. Wahlstrom
Optical Mineralogy	F.F. Kerr
Elements of Optical Mineralogy	A.N. Winchell

B.Sc II Year (GEOLOGY) III SEMESTER

**U – GEOL 301 PALAEOLOGY**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

\*Internal

Unit I

Fossil, mode of preservation of fossils, condition of fossilization. Concept of species, organic evolution, theories of evolution – Lamarckism and Darwinism.

Unit II

Morphology, classification, distribution and geological history of brachiopoda, trilobite, mollusca (gastropoda, cephalopoda and pelecypoda) and graptoloidea

Unit III

Elementary idea of vertebrate life. Evolution of horse, elephant and man. Classification of plant kingdom and Gondwana flora. Morphology of Echinoids and their environmental significance.

Unit IV

Elementary idea of micropalaeontology and its scopes. Morphology of foraminifers and ostracodes. Fossils spores and pollen

**Books recommended**

1. Invertebrate palaeontology. H.Wood
2. Principles of Invertebrate Palaeontology. Shrock and Twenhoffel
3. Invertebrate fossils. Moore, Lalicker and Fisher
4. Evolution of vertebrates. E.A.Colbert
5. Microfossil. Brasier

B.Sc II Year (GEOLOGY) III SEMESTER

**U – GEOL 302 STRATIGRAPHY**

**Max. Marks: 40+10\***

**Time: 3 hrs**

\*Internal

Unit I

Definition of stratigraphy, principles of stratigraphy, stratigraphic nomenclature – lithostratigraphic, biostratigraphic and chronostratigraphic classifications. Geological time scale. Principles of correlation.

Unit II

Precambrian stratigraphy:- Archean Provinces of India – Dharwar, Singhbhum, Eastern Ghat, Central Indian and Aravalli, Bhundelkhand. Stratigraphy of Cuddapah and Vindhyaans.

Unit III

Palaeozoic stratigraphy of India with emphasis to Spiti basin, Kashmir basin and Kumoun basin. Gondwana sequence, Deccan traps and associated sedimentaries.

Unit IV

Mesozoic stratigraphic of India – Spiti, Rajasthan, Kutch and Tamil Nadu. Tertiary and Quaternary stratigraphic successions of India.

Books Recommended

1. Geology of India. D.N.Wadia
2. Geology of India and Burma. M.S.Krishnan
3. Fundamentals of historical geology and stratigraphic of India. Ravindra Kumar
4. Principles of stratigraphy. Dunbar and Rogers
5. Geology and evolution of Indian plate. S.M.Naqvi

B.Sc II Year (GEOLOGY) IV SEMESTER

**U-GEOL-401 PETROLOGY - I**

**Max. Marks: 40+10\***

**Time: 3 hrs**

\*Internal

Unit I

Magma – composition and type (acid and basic). Evolution of magma – magmatic differentiation and assimilation. Bowen reaction series.

Unit II

Phase rule – Unicomponent and bicomponent systems. Form, structure, texture and classification of igneous rocks

Unit III

Mode of occurrence, field relationships and petrography of the following rock types with Indian examples:- granite, granodiorite, rhyolite, pegmatite, syenite, diorite, trachyte, gabbro, basalt and dolerite.

Unit IV

Metamorphism – definition, scope, agents and types. Concept of grade, zone and facies of metamorphism. Structure and texture of metamorphic rocks. Metamorphic differentiation.

**Books recommended:-**

1. Principles of petrology. G.W.Tyrrell
2. Petrology. Ehlers and Blatt
3. Petrology of Igneous and metamorphic rocks. Best
4. Igneous and metamorphic petrology. Turner and Verhoogen
5. Petrology of Igneous rocks. Hatch, Wells and Wells
6. Petrology of Igneous and metamorphic rocks of India. Chatterjee
7. Petrography Williams. Turner and Gilbert

8. The studies of rocks in thin section. Moorhouse

B.Sc II Year (GEOLOGY) IV SEMESTER

**U-GEOL-402 PETROLOGY - II**

**Max. Marks: 40+10\***

**Time: 3 hrs**

\*Internal

Unit I

Field association and petrography of the following metamorphic rocks with Indian examples:- slate, phyllite, schist, gneiss, quartzite, marble, granulite, migmatite and amphibolite.

Unit II

Sedimentary rocks – Definition, mode of origin of sediments – physical and chemical weathering. Broad generalized classification. Composition and relative abundance of common rock types. Concept of size, size grade scales.

Unit III

Shape, roundness, texture and fabric of sediments and cements. Oolites, pisolites, spastoliths and spherulites. Porosity and permeability of sediments. Inorganic and organic sedimentary structures – their classification and significance.

Unit IV

Orthoconglomerates, paraconglomerates, arkose, lithic sandstones, graywackes, quartz arenites, shales, cherts and limestones. Heavy minerals and their significance. Mineral stability, maturity and provenance studies. Concept of lithification and diagenesis of sediments

**Books recommended:-**

- 1 Principles of petrology. G.W.Tyrrell
- 2 Petrology. Ehlers and Blatt
- 3 Petrology of Igneous and metamorphic rocks. Best
- 4 Igneous and metamorphic petrology. Turner and Verhoogen
- 5 Petrology of Igneous and metamorphic rocks of India. Chatterjee
- 6 Petrography Williams. Turner and Gilbert
- 7 The studies of rocks in thin section. Moorhouse

- 8 Sedimentary rocks. Pettijohn
- 9 Petrology of Sedimentary rocks. Greensmith

### **B.Sc III YEAR (GEOLOGY) V SEMESTER**

**U GEOL-501 Economic Geology**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

**\*Internal**

#### Unit-I

Elementary concept of the following ore forming processes: magmatic, Hydrothermal, Sedimentary, Residual and mechanical concentration, Oxidation and supergene enrichment.

#### Unit -II

The study of physical properties and uses of the ores of the following with reference to Indian occurrences: Iron, manganese, aluminum, copper, lead, zinc, tin, tungsten, molybdenum, uranium thorium, chromium, nickel, cobalt, antimony, gold, silver and platinum.

#### Unit-III

Energy mineral- Petroleum, its origin, migration, accumulation and geological occurrences in India.

#### Unit-IV

Energy minerals- coal and atomic minerals, their origin and geological occurrences in India.

#### **Books recommended :-**

1. India's Mineral Resources S.Krishnaswami
2. Industrial Mineral and rocks of India. S.Deb

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|---------------------------------|-----------------|
| 3. Economic mineral deposits    | A.M.Bateman     |
| 4. Ore deposits of India        | Gokhale and Rao |
| 5. Geology and mineral deposits | Smirnov         |

**B.Sc III YEAR (GEOLOGY) V SEMESTER**

**U GEOL-502 Exploration Geology & Remote Sensing**

**Max. Marks: 40+10\***

**Time: 3 hrs.**

**\*Internal**

**Unit-I**

Surface expression and indications of economic deposits-Old working, gossans and cap rocks: geobotanical and geochemical guides.

**Unit-II**

Techniques of surface and subsurface sampling (pitting, trenching, drilling and delineation of anomalies with typical examples.

**Unit-III**

Elementary idea of Geophysical investigations-electrical magnetic, gravity, seismic and radioactive. Elementary idea about geophysical well logging.

**Unit-IV**

Remote Sensing techniques to delineate geomorphic, lithological , Structural features and identification of various types of earth resources.

Books recommended:-

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|--|---------------------------|
| 1. Mining Geology                                      | R.M.Arogyaswamy           |
| 2. Practical manual of exploration and<br>Prospecting  | S.K.Babu                  |
| 3. Principles and practicals of mineral<br>Exploration | D.K.Sinha                 |
| 4. Elements of prospecting and<br>Exploration          | Bagchi, Sen Gupta and Rao |
| 5. Principles of application of<br>Photogeology        | S.N.Pandey                |
| 6. Photogeology  | Miller and Miller         |

**B.Sc III YEAR (GEOLOGY) VI SEMESTER**  
**U GEOL-601 Engineering Geology & Mining Geology**

**Max. Marks: 40+10\***  
**Time: 3 hrs.**

**\*Internal**

**Unit-I**

Engineering properties of rocks, rocks as building and construction materials. Engineering structures-River Valley project, dams, tunnels, highways and bridges,

**Unit-II**

Land hazards due to earthquakes and landslide and their impact on engineering structures. Construct on material of geology, basis of their selection and use. Techniques for selection and evaluation of sites for various engineering structures.

### Unit-III

Mining: definition & terminology; elementary aspects of various types of mining methods.

Unit-IV: Role of geologists in mines, Mining safety, mines environmental safe guards and mines legislation.

Books recommended:-

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|--|-----------------------------|
| 1. Mining and Environment in India<br>Bhattacharya | S.C.Joshi and G.            |
| 2. Mining Geology                                  | R.M.Arogyaswamy             |
| 3. Engineering Geology                             | Krynine and Judd            |
| 4. Engineering Geology                             | Blyth                       |
| 5. Soil Mechanics                                  | T.W.Lambe and<br>R. Whitman |

**B.Sc III YEAR (GEOLOGY) VI SEMESTER**  
**U GEOL-602 Hydrogeology and Environmental Geology**

**Max. Marks: 40+10\***  
**Time: 3 hrs.**

**\*Internal**  
**Unit-I**

Occurrence of groundwater, hydrologic cycle, groundwater aquifers and their parameters. Groundwater quality criteria for different uses.

### Unit-II

Conjunctive use and groundwater management, water-logging and relative problems; exploration and evaluation of groundwater potential.

### Unit-III

Basic principles of environment and ecosystem in relation to geology. Anthropologic activities and their impact on environment. Environment energy projects and natural hazards with typical examples.

### Unit-IV

Atmosphere-its composition and structure, increasing CO<sub>2</sub> trend and greenhouse gases, greenhouse impacts on global environment.

### Books recommended

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|------------------------------------|-----------------------|
| 1. Groundwater Hydrology           | D.K Toad              |
| 2. Groundwater                     | Cheery and Greeze     |
| 3. Hydrogeology<br>Dewiest         | S.N Davis, and R.J.M. |
| 4. Groundwater resources Evolution | W.C Walton            |
| 5. Hydrology                       | C.Meinzier            |
| 6. Hand book of Applied Hydrology  | Chow                  |
| 7. Environmental Geology           | L. Lindgrein          |