

ACHARYA NAGARJUNA UNIVERSITY :: NAGARJUNANAGAR-522 510

CBCS -B. Sc. GEOLOGY Syllabus

With effective from 2015-16

S.No	Semester	Title of the Paper	Max.Marks
1	Semester-I	P-I Physical Geology & Crystallography	75+25
2	Lab-I	Physical Geology & Crystallography	75+25

External -- 75Marks

Internal -- 25Marks

Assignments - 5 Marks

Attendance - 5 Marks

Mid Exam - 15 Marks

Total: -----
100 Marks

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SEMESTER-I

Paper- I - Physical Geology&Crystallography

Unit -I

General aspects. Definition of geology - Basic assumptions of Geology - Its relationship with other sciences - Branches of geology - Aim and applications of geology. Earth as a planet: its shape, size, and density - movement and then effects. Origin and age of the earth.

Geological process - exogenic and endogenic. Definition of weathering- types of weathering of rocks- Physical and chemical; Definition of erosion and denudation, cycle of erosion; erosion, transportation and deposition; agents of erosion.

(12 hrs)

Unit-II

Rivers: Erosion, transportation and deposition of river (fluvial) cycle in different stages -Development of typical land forms by river erosion and deposition. V or V-Shaped valley. U-shaped valley. Waterfall alluvial form, meander, ox-bow lake-flood plane, natural plane, peneplain and deltas. Types of rivers.

Groundwater: Storage of ground water - porosity, permeability, aquifer, water table, zone of saturation, artesian well, spring, geysers - development of typical land form by erosion and deposition by groundwater [Karst topography] sinkhole, cavern, Stalactites and stalagmites.

Glaciers: Definition of a glacier - types of glaciers - development of typical land forms by glacial erosion and deposition - cirque, hanging valley, Rocks-monadnocks. Morains, drum-line, kames, eskers and varves. Characteristic features of glaciated regions

(12 hrs)

Unit-III

Seas: offshore profile - land forms of sea - marine deposits and coral reefs. Lacustrine deposits.

Wind: Development of characteristic features by wind (arid cycle), erosion and deposition - pedestal rock - mushroom topography - Inselberg - Ventifacts-sand dunes.

Earthquakes: Cause, kinds of earthquake waves, and mode of propagation, intensity of earthquakes, Richters scale - seismograph and seismogram. Effects of earthquakes, earthquake zones - Interior of the earth based on seismic theory -

Volcanoes: origin, products of Volcanoes.

Introduction of concepts of Continental Drift & Plate tectonics: (12hrs)

Unit-IV

Definition of a crystal - amorphous and crystalline states. Morphology of Crystals - face, edge, solid angle, interfacial angle. Forms: Simple, combination, closed

and open forms. Symmetry: Plane, axis, center. Crystallographic axes. Parameters, indices; crystallographic notation - parameter system of Weiss, index system of Miller.

Classification of crystals into systems.

Morphological study of the following classes of symmetry

- I. Cubic system - Galena type
- II. Tetragonal system - Zircon type

(12 hrs)

Unit-V

Morphological study of the following classes of symmetry

- III. Hexagonal system - Beryl type
- IV. Trigonal system - Calcite type.
- V. Orthorhombic system - Barites type
- VI. Monoclinic system - Gypsum type -
- VII. Triclinic system - Axinite type

Twinning: Definition of twinning, Laws of twinning and Types of twinning

Text books:

1. Holmes Principles of Physical Geology- D.L. Holmes
2. Physical Geology - A.N. Stracher
3. A book of Physical Geology - A K Datta
4. An Introduction to Crystallography - R.C. Phillips
5. Essential of Crystallography- E. Flint.

References:

1. Basic Physical Geology- E.S. Robinson
2. The evolving Earth: A text in Physical Geology - E.S. Sawkins. et al.
3. Physical Geology- B.F. Mallory and D.N. Gargo
4. A textbook of mineralogy - E.S. Dana and W.E. Ford

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LAB-I (Practicals) 100 Marks

At the end of First semester

Practical-I- Physical Geology & Crystallography

Identification of geomorphological features of Geomorphological Models.

Study of symmetry, and form of the Normal classes of seven crystal systems of the following:

- I. Cubic system – Normal (Galena)
- II. Tetragonal system – Zircon type
- III. Hexagonal system – Beryl type
- IV. Trigonal system – Calcite type
- V. Orthorhombic system – Barites type
- VI. Monoclinic system – Gypsum type
- VII. Triclinic system – Axinite type

Acharya Nagarjuna University
B.Sc Geology
SEMESTER-II 2015-16
Paper-II- Mineralogy & Optical Mineralogy

Unit - I

Definition of a mineral - classification of minerals into rock forming and ore forming minerals.

Physical properties of minerals - Colour, streak, transparency, lustre, form, hardness, tenacity, cleavage, fracture and specific gravity.

Silicate structures- isomorphism, solid solution, polymorphism, allotropy, Pseudomorphism and radioactivity

Study of physical properties, chemical properties and mode of occurrence of the following mineral groups: Olivine, Garnet and Aluminium silicates. (12 hrs)

Unit-II

Study of physical properties, chemical properties and mode of occurrence of the following mineral groups: Pyroxenes, Amphiboles and Mica

(12 hrs)

Unit-III

Study of physical properties, chemical properties and mode of occurrence of the following mineral groups: Quartz and its varieties, Feldspars, and feldspathoids
Miscellaneous: Staurolite, Tourmaline, Zircon, Calcite, Corundum and Apatite.

(12 hrs)

Unit-IV

General Principles of optics, Refraction, Reflection Snell's law, Critical angle, total reflection. Isotropic and anisotropic minerals.

Polarised light, refractive index, double refraction, uniaxial and biaxial minerals – Nicol prism and its construction. (12hrs)

Unit-V

Petrological microscope (Polarising) - its mechanical and optical parts – optical properties of Minerals - extinction, pleochroism and interference colours. Optical Properties of important minerals

(12hrs)

Text books:

1. A textbook of mineralogy - E.S. Dana and W.E. Ford.
2. Rutleys elements of mineralogy - H.H. Reed
3. Elements of Crystallography - F.A.Wade and R.B.Matrix

Reference Books:

1. Manual of mineralogy - C.S. Hurlbut and C.Klein
2. Mineralogy for students - M.H. Batey.
3. An introduction to rock forming minerals - Deer, Howie, and zussman.
4. Elements of mineralogy - Mason and Bern.
5. Essential of Crystallography- E. Flint.

LAB-II (Practicals) 50 Marks

At the end of Second semester

Practical-II- Mineralogy and Optical mineralogy

Study of physical properties and diagnostic features of the following mineral:

Quartz Jasper, Agate, Chalcedony, Amethyst, Orthoclase, Microcline, Anorthite, Enstatite, Hypersthene, Augite, Hornblende, Actinolite, Tremolite, Asbestos, Muscovite, Biotite, Phlogopite, Olivine, Epidote, Garnet, Kyanite, Sillimanite, Andalusite, Beryl, Zircon, Apatite, Corundum, Talc, Gypsum, Calcite, Fluorspar and Serpentine.

Study of optical properties of the following minerals:

Quartz, Orthoclase, Microcline, Plagioclase, Hypersthene, Augite, Tremolite, Hornblende, Muscovite, Biotite, Olivine, Epidote, Garnet, Kyanite, Beryl, Calcite, Chlorite, sillimanite and Leucite.

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B.Sc Geology
III-SEMESTER

Paper- III - Igneous Petrology and Sedimentology

Unit-I

Nature and scope of petrology - definition of rock, classification of rocks into igneous, sedimentary and metamorphic.

Distinguish features of three types of rocks.

Forms - Lava flows, Intrusions, sills, laccolith, lopolith, dykes, ring dykes - vesicular, amygdaloidal, block lava, ropy lava, pillow, flow, and sheet structures. Columnar and prismatic structures (12hrs)

Unit-II

Textures - Definition of texture, micro-structure, devitrification- Hypidiomorphic, pandiomorphic, porphyritic, poikilitic, ophitic, intergrartular, intersertal, trachytic, graphic and micro-graphic textures. Classification of igneous rocks - CIPW and Tyrrell tabular classification.

Descriptive study of the following rock types: Granite, Syenite, Diorite, Pegmatite, Gabbro, Pyroxenite, Dunite, Dolerite, Rhyolite, Trachyte and Basalt (12hrs)

Unit-III

Composition and constitution of magma - Crystallisation of magma - Unicomponent, binary system, eutectic and solid solutions.

Origin of igneous rocks - Bowen's reaction principle, differentiation and assimilation of magma.

(12hrs)

Unit - IV

Sources of sediments - mechanical and chemical weathering, modes of transportation, stratification. Sedimentary structures - Types of bedding, surface marks, deformed bedding, solution structures. (12hrs)

Unit-V

Classification of sedimentary rocks; clastic - rudaceous, arenaceous, argillaceous, non-clastic --calcareous, carbonaceous, evaporities.

Descriptive study of the following sedimentary rocks - conglomerate, Breccia, Sandstone, Gritt, Arkose, Shale and limestone. (12 hrs)

Text books

1. Principles of petrology - G.W. Tyrrell
2. Sedimentary Rocks - F.J. Peetijohn

Reference Books:

1. Igneous Petrology - Hyndman
2. A Text book of sedimentary petrology - Verma & Prasad
3. Petrology of the sedimentary rocks - J.T. Greehsmith
4. Petrology of the igneous rocks - F.K Hatch, Wells and Wells.

LAB-III (Practicals) 50 Marks

At the end of Third semester

Practical- II- Igneous Petrology and Sedimentology

Megascopeic and microscopeic study of the following igneous rocks:

Dunite, Peridotite, Granite, Syenite, Diorite, Gabbro. Dolerite, Rhyolite, Basalt and Pegmatite.

Megascopeic and microscopeic study of the following sedimentary rocks:

Conglomerate, Breccia, Sandstone, Arkose, Gritt, Shale, Limestone and its varieties.

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B.Sc Geology
IV-SEMESTER

Paper-IV- Metamorphic Petrology and Structural Geology

Unit-I

Metamorphism - agents of metamorphism, types of metamorphism, grades and zones of metamorphism. Structures of metamorphic rocks - Cataclastic, maculose, schistose, granulose and gneissose. Textures of metamorphic rocks - crystalloblastic, xenoblastic.

(12 hrs)

Unit-II

Classification of metamorphic rocks. Cataclastic metamorphism of argillaceous and arenaceous rocks. Thermal metamorphism of argillaceous, arenaceous and calcareous rocks. Dynamothermal metamorphism of argillaceous, arenaceous and igneous rocks.

Descriptive study of the following metamorphic rocks - Gneiss, schist, slate, phyllite, quartzite, marble, Charnockite and khondalite.
(12 hrs)

Unit-III

Definition of structural geology - aim and objectives of the structural Geology; importance of study of structures - primary and secondary structures; outcrop, attitude of beds - strike and dip. Use of clinometer and Brunton compass. Folds -description, nomenclature of folds - Geometrical and genetic classification. Recognition of folds in the field.
(12 hrs)

Unit-IV

Joints-Classification of Joints- geometrical and genetic classification. Faults - geometrical and genetic classification of faults, recognition of faults in the field.

(12 hrs)

Unit-V

Unconformities- types of unconformities. Recognition of unconformities in the field. Distinguishing the faults from unconformities. Definitions of overlap, outlier, cleavage, schistosity, foliation and lineation

(12 hrs)

Text books

1. The principles of petrology - G. W. Tyrrell
2. Metamorphic petrology - B. Bhaskar Rao
3. Structural Geology - Marlarid. F. Billings.

Reference Books:

1. Petrology of Igneous and Metamorphic rocks. - Hyndman
2. Structural Geology - L.U. De Setter
3. An outline of structural Geology - E.S. Hills

LAB-IV (Practicals) 50 Marks

At the end of Fourth semester

Practical- IV: Metamorphic Petrology and Structural Geology

Megascopic and microscopic study of the following rocks: Schist, Gneiss, Quartzite, Marble, slate, phyllite, charnockite and khonodolite.

Study of topographical maps: Interpretation of simple geological maps with horizontal and inclined beds. Unconformity, folds and faults with reference to the topography and structure, geological succession and history. Geological Section drawing (at least 8 maps)

Problems dealing with true dip and apparent dip. Bore-hole data thickness and width of the outcrop and dip of the beds (At least 8 problems for each method).