HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

NAAC Accreditation Grade - "B"

SYLLABUS

(As per the Guidelines of UGC)

Semester III and IV

For Graduate Degree in

GEOLOGY

(Earth Sciences)

(In force from June, 2016)

Three Years – Six Semester studies leading to
Degree of Bachelor in Science (B. Sc.)
Based on
Choice Based Credit System (CBCS)

Submitted by
Department of Geology
R. R. Mehta College of Science
Palanpur-385001

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B. Sc. SEMESTER – III

Design and Structure of Geology (Earth Sciences) UG Courses for Choice Based Credit System to be implemented from June 2016.

Units	Geology Theory	Geology Theory	Geology Practical
	GEO 201	**GEO 202**	**GEO 203**
	4 Credits	**4 Credits**	**2.5 Credits**
	Lectures per week : 4	Lectures per week : 4	Practical per week : 2 of three hours each
	Total Marks : 100	Total Marks : 100	Total Marks : 100
	Internal Marks : 30	Internal Marks : 30	Internal Marks : 30
	External Marks : 70	External Marks : 70	External Marks : 70
I	General Geology	Optical Mineralogy	Mineralogy, Crystallography, Petrology, Structural Geology Laboratory Work
II	Physical Geology, Hydrogeology	Crystallography	
III	Stratigraphy, Palaeontology	Petrology	
IV	Structural Geology, Economic Geology	Economic Geology	

Compulsory field work in a suitable geological area to study the elementary aspects of field geology either in semester III or semester IV.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. GEOLOGY Theory: SEMESTER-III

(Semester end Examination)

CC GEO-201 TH: General Geology, Physical Geology, Hydrogeology, Stratigraphy, Palaeontology, Structural Geology, Economic Geology.

&

CC GEO-202 TH: Optical Mineralogy, Crystallography, Petrology, Economic Geology.

Format for Question paper Core Compulsory Courses in GEOLOGY

Time: 3Hrs **Total Marks: 70**

Part A

(Answer all **questions)**

1-06. Questions such as, MCQs, Fill in the blanks, Match the pairs, etc. (Each of **1** Mark) [Covering All Units]

Part B

(Answer all questions)

07-11. Very short answer type questions such as, Definition, Explain the terms, Examples etc. (Each of **2** Mark) [Covering All Units]

Part C

(Answer any Five/Eight of the following)

12-19. Short answer type questions such as, Definition, Explain the terms, examples/problems, reasons, differences, figures/diagrams, etc. (Each of **2** Marks) [Covering All Units]

Part D

(Answer any Five/Eight of the following)

20-27. Medium answer type questions such as, Short notes, figures/diagrams, examples/problems, reasons, differences, etc. (Each of **4** Marks) [Covering All Units]

Part E

(Answer any Four/Eight of the following)

28-35. Long answer type questions such as, Describe / Discuss in detail, diagrams, examples/ problems, etc. (Each of **6** Marks) [Covering All Units]

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. GEOLOGY Practical: SEMESTER-III

CC GEO-203 PR: Mineralogy, Crystallography, Petrology, Structural Geology Lab.

(In force from June 2016)

❖ **Study of the Physical and Optical properties of the minerals**

1) **Megascopic identification of the following common rock forming minerals:**
   Bloodstone, Flint, Opal, Beryl, Fluorite, Halite, Talc, Asbestos, Apatite, Graphite, Calcite, Dolomite, Magnesite, Baryte, Gypsum.
2) **Megascopic identification of the following common rock forming mineral (Ores):** Limonite, Ilmenite, Siderite, Chalcopyrite, and Malachyte.
3) **Microscopic identification of following minerals:**
   Hornblende, Hypersthene, Augite, Olivine, Tourmaline, Calcite, Sphene, Garnet, Apatite.

❖ **Study of the Physical properties of the rocks**

4) **Megascopic identification of the following rocks:**
   Graphic Granite, Porphyritic Granite, Pegmatite, Trachyte, Obsidian, Pumice, Slate, Schist, Gneiss.

❖ **Study of the Crystallography systems:**

5) Identification of crystal models belonging to Cubic and Tetragonal systems with their forms and indices.

❖ **Study of Structural Geology :**

6) Construction of topographic profile, geological cross sections of horizontal beds with igneous intrusions and simple geometrical exercises.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

S. Y. B. Sc.

SEMESTER III

GEOLOGY - THEORY and PRACTICALS

Course-wise detail syllabus

GEO 201 TH: General Geology, Physical Geology, Hydrogeology, Stratigraphy, Palaeontology, Structural Geology, Economic Geology.

Unit vise Course details

Unit –1 **GENERAL GEOLOGY:** Isostasy, Continental drift, Plate tectonics.

Unit –2 **Physical Geology:** Seas and Oceans – Currents, waves and tides, hypsographic curve, marine erosion and deposition.

Hydrogeology: Terminology, Ground water as a geological agent, springs, Hydrological cycle. Classification of subsurface water.

Unit – 3 **Stratigraphy:** General principles and Laws of Stratigraphy, Terminology of Stratigraphy. Geological Time scale – major divisions of earth's geologic history.

Palaeontology: Definition. Elementary ideas about origin of life, evolution and fossil record. Conditions of entombment, preservation and modes of fossilisation.

Unit – 4 **Structural Geology**: Terminology, Elevation and relief, contours, outcrops, Dip Strike. Maps, Scales – their representation on maps.

Economic Geology: Introduction to common rock forming, ore forming and industrial minerals. Important economic minerals of India and their distribution. Study of the following economic minerals with reference to India: Mica, Iron.

GEO 202 TH: Optical Mineralogy, Crystallography, Petrology, Economic Geology.

Unit vise Course details

Unit –1 **Optical Mineralogy:** R. I. of minerals, Beck's test and its effects. Twinkling, Pleochroism, Extinction. Elementary knowledge of interference colours and twinning.

Unit –2 **Crystallography:** Crystal systems: Cubic and Tetragonal - their study with examples in details.

Unit – 3 **Petrology:** Modes of occurrence and structures of igneous rocks – detailed study.

Sedimentary rocks**:** Structures and importance of sedimentary rocks. Metamorphic rocks**:** Structures and their Importance.

Unit – 4 **Economic Geology:** Study of the following economic minerals with reference to India: Manganese-, Chromium-, Aluminum-ores, Diamond, and Asbestos.

Reference Books:

1) Introduction to Physical Geology, A. K. Datta, Kalyani Publisher, New Delhi.
2) A Text Book of Geology, P. K. Mukerjee, World press.
3) A Text Book of Geology with Special Reference to India, G. B. Mahapatra.
4) General Geology, V. Radhakrishnan (1987), V.V.P. Publishers, Tuticorin.
5) Principles Physical Geology, Arthur Holmes (1978), ELBS.
6) Rutley's Elements of Mineralogy, H. H. Read, CBS publishers.
7) Introduction to Rock Forming Minerals, R. A. Deer, R. E. Howie and J. Zussman (1978), The English Language Book Society.
8) Elements of Optical Mineralogy, N. H. Winchel, A. N. Winchel (1968), Willey, Delhi.
9) The Principles of Petrology, G. W. Tyrell (1960), Asia Publishing House.
10) Mineral Economics, R. K. Sinha and N. L. Sharma (1981), Oxford IBH Publishers.
11) India's Mineral Resources, S. Krishnaswamy, (1979) Oxford & IBH Co.
12) Invertebrate Palaeontology, H. Woods (1982), Cambridge University Press.

GEO 203 PR: Mineralogy, Crystallography, Petrology, Structural Geology Lab.

Course details

1) **Megascopic identification of following minerals:**

   Bloodstone, Flint, Opal, Beryl, Fluorite, Halite, Talc, Asbestos, Apatite, Graphite, Calcite, Dolomite, Magnesite, Baryte, Gypsum.

2) **Ores:**

   Limonite, Ilmenite, Siderite, Chalcopyrite, Malachyte.

3) **Microscopic identification of following minerals:**

   Hornblende, Hypersthene, Augite, Olivine, Tourmaline, Calcite, Sphene, Garnet, Apatite.

4) **Megascopic identification of following rocks:**

   Graphic Granite, Porphyritic Granite, Pegmatite, Trachyte, Obsidian, Pumice, Slate, Schist, Gneiss.

5) **Crystallography:**

   Study of typical crystal models belonging to Cubic and Tetragonal systems with their forms and indices in details.

6) **Structural Geology:**

   Construction of topographic profile, geological cross sections of horizontal beds with igneous intrusions and simple geometrical exercises.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
B. Sc. SEMESTER – IV

Design and Structure of Geology (Earth Sciences) UG Courses for Choice Based Credit System to be implemented from June 2016.

Units	Geology Theory	Geology Theory	Geology Practical
	GEO 204	**GEO 205**	**GEO 206**
	4 Credits	**4 Credits**	**2.5 Credits**
	Lectures per week : 4	Lectures per week : 4	Practical per week : 2 of three hours each
	Total Marks : 100	Total Marks : 100	Total Marks : 100
	Internal Marks : 30	Internal Marks : 30	Internal Marks : 30
	External Marks : 70	External Marks : 70	External Marks : 70
I	Dynamics of the Earth	Physical Geology, Soil	Crystallography, Petrology, Structural Geology, Palaeontology Laboratory Work
II	Stratigraphy, Physiography of India	Chemical Mineralogy, Crystallography	
III	Structural Geology	Geomorphology, Engineering Geology	
IV	Economic Geology	Stratigraphy, Palaeontology	

Compulsory field work in a suitable geological area to study the elementary aspects of field geology either in semester III or semester IV.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. GEOLOGY Theory: SEMESTER-IV

(Semester end Examination)

CC GEO-204 TH: Dynamics of the Earth, Stratigraphy, Physiography of India, Structural Geology, Economic Geology.

&

CC GEO-205 TH: Physical Geology, Soil, Chemical Mineralogy, Crystallography, Geomorphology, Engineering Geology, Stratigraphy, Palaeontology.

Format for Question paper Core Compulsory Courses in GEOLOGY

Time: 3Hrs **Total Marks: 70**

Part A

(Answer all **questions)**

1-06. Questions such as, MCQs, Fill in the blanks, Match the pairs, etc. (Each of **1** Mark) [Covering All Units]

Part B

(Answer all questions)

07-11. Very short answer type questions such as, Definition, Explain the terms, Examples etc. (Each of **2** Mark) [Covering All Units]

Part C

(Answer any Five/Eight of the following)

12-19. Short answer type questions such as, Definition, Explain the terms, examples/problems, reasons, differences, figures/diagrams, etc. (Each of **2** Marks) [Covering All Units]

Part D

(Answer any Five/Eight of the following)

20-27. Medium answer type questions such as, Short notes, figures/diagrams, examples/problems, reasons, differences, etc. (Each of **4** Marks) [Covering All Units]

Part E

(Answer any Four/Eight of the following)

28-35. Long answer type questions such as, Describe / Discuss in detail, diagrams, examples/ problems, etc. (Each of **6** Marks) [Covering All Units]

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. GEOLOGY Practical: SEMESTER-IV

CC GEO-206 PR: Crystallography, Petrology, Structural Geology and Palaeontology Lab.

(In force from June 2016)

- **Study of the Optical properties of the Rocks**

1) Microscopic identification of following rocks:

Granite, Syenite, Gabbro, Rhyolite, Trachyte, Basalt, Conglomerate, Sandstone, Limestone, Quartzite, Marble, Schist, Gneiss.

- **Study of the Crystallography systems:**

2) Identification of typical crystal models belonging to Orthorhombic and Hexagonal (Beryl and Calcite types) systems with their forms and indices.

- **Study of Palaeontology:**

3) Identify typical fossil specimens showing Modes of fossilization – Petrifaction, Mould of skeleton and Imprint.

- **Study of Structural Geology :**

4) Construction of geological cross sections of inclined beds with igneous intrusions, geometrical exercises, outcrop filling problems.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

S. Y. B. Sc.

SEMESTER IV

GEOLOGY - THEORY and PRACTICALS

Course-wise detail syllabus

GEO 204 TH: Dynamics of the Earth, Stratigraphy, Physiography of India, Structural Geology, Economic Geology.

Unit vise Course details

Unit –1 **Dynamics of the Earth:**

Diastrophism – evidences of upheaval and subsidence.

Atmospheric circulation, weather and climate changes.

Land – air – sea interaction, earth's heat budget and global climatic changes.

Unit –2 **Stratigraphy:**

Correlation and Homataxis of strata, lithostratigraphic, chronostratigraphic and biostratigraphic units.

Physiographic and structural subdivisions of India and their characteristics.

Unit –3 **Structural Geology:**

Structures in rocks – primary and secondary. Elementary study of joints, faults, and folds – their types and classification. Inliers and Outliers. Unconformity and Overlap.

Unit –4 **Economic Geology:**

Basic ideas about the methods of mineral exploration.

Study of the following economic minerals with reference to India: Coal and Petroleum, Minerals used for Cement, Glass and Ceramic industries. Fertilizer minerals.

GEO 205 TH: Physical Geology, Soil, Chemical Mineralogy, Crystallography, Geomorphology, Engineering Geology, Stratigraphy, Palaeontology.

Unit vise Course details

Unit –1 **Physical Geology:** Geophysical conditions of the earth – Gravity, Magnetic, and Heat flow. Ocean as a thermostat for the earth's surface heat balance.

Soil: Soils – definition, classification, composition, texture, fertility, chief types and soil profile. Soil-erosion and conservation.

Unit –2 **Chemical Mineralogy:** Chemical properties of minerals including isomorphism, polymorphism, pseudomorphism, fluorescence and phosphorescence. Importance of minerals.

Crystallography: Crystal systems: Orthorhombic, Hexagonal (Beryl and Calcite types only) – their study with examples in details.

Unit –3 **Geomorphology:** General principles of geomorphology; types and study of landforms. Broad ideas on the aspects of applied geomorphology.

Engineering Geology: Geology in relation to engineering. Properties on rocks to be used as building stones.

Unit –4 **Stratigraphy:** Classification of geological formations of India. Brief account of different geological formations of India. Study of Archean and Dharwar formations of India along with their economic importance.

Palaeontology: Systematic classification of organisms – their characters, environmental factors and geological distribution of mollusca, brachiopoda, echinodermata and arthropoda. Uses of fossil study.

Reference Books:

1) Geology of India, D. N. Wadia (!978), Tata Mc. Graw Hill.
2) Invertebrate Palaeontology, H. Woods (1982), Cambridge University Press.
3) Mineral Economics, R. K. Sinha and N. L. Sharma (1981), Oxford IBH Publishers.
4) Manual of Geological Maps, Gokhale.
5) Structural Geology, M. P. Billings (1977), Prentice Hall.
6) India's Mineral Resources, S. Krishnaswamy, (1979) Oxford & IBH Co.
7) Rutley's Elements of Mineralogy, H. H. Read, CBS publishers.
8) Principles Physical Geology, Arthur Holmes (1978), ELBS.
9) Engineering and General Geology, Parbin Singh (1994), S.K. Kataria and Sons, Delhi.
10) Geomorphology, Enayat Ahmed, Kalyani Publisher, New Delhi.
11) Principles of Geomorphology, W. D.Thornbury (1969), John Willey Inc.

GEO 206 PR: Crystallography, Petrology, Structural Geology & Palaeontology Lab.

Course details

- **Microscopic identification of following rocks:**

  Granite, Syenite, Gabbro, Rhyolite, Trachyte, Basalt, Conglomerate, Sandstone, Limestone, Quartzite, Marble, Schist, Gneiss.

- **Crystallography:**
  Study of typical crystal models belonging to Orthorhombic and Hexagonal (Beryl and Calcite types) systems with their forms and indices in details.
- **Palaeontology:**
  Typical fossil specimens showing Modes of fossilization – Petrifaction, Mould of skeleton and Imprint.
- **Structural Geology:**
  Construction of geological cross sections of inclined beds with igneous intrusions, geometrical exercises, outcrop filling problems.

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