KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY,
BHUJ.

Year: 2023-2024

B.Sc (Honours) Geology

(With Research /Without Research)

Semesters : II
(Exit option)

FACULTY OF SCIENCE

SYLLABUS

Curriculum as per UGC Guideline
Framed according to National Education Policy (NEP) - 2020
With effect from June – 2023 (and thereafter)

B.Sc. (Honours) Geology Programme

(With Research/without Research)

NEP-2020

With effect from June – 2023 (and thereafter)

FACULTY OF SCIENCE

Subject: GEOLOGY

B. Sc. Semesters: II

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN GEOLOGY HONOURS)

A bachelor's degree in Geology with Research or without Research is a 4 year degree course which is divided into 8 semesters.

Sl.No.	Type of Award	Stage of Exit	Mandatory Credits to secure Degree Award
1	Certificate in the Discipline	After successful completion of1st Year	
2	Diploma in the Discipline	After successful completion of1st and 2nd Years	
3	B.Sc. in Geology	After successful completion of1st, 2nd and 3rd Years	
4	B.Sc. (Honours with Research/ without Research) in Geology	After successful completion of1st, 2nd, 3rd and 4th Years	

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures required Credits. Similarly, for certificate, diploma and degree, a student needs to fulfill the associated credits. An illustration of credits requirements in relation to the type of award is illustrated as above.

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, B.Sc. (Honours) Course in Geology aims to prepare students to qualify for joining a profession or to provide development opportunities in particular employment settings.

AIMS:

1. To develop the curriculum for fostering subjective-learning.
2. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
3. To shape students as a responsible and sensible citizen.
4. To offer an environment that guarantees intellectual development of students in an all-inclusive manner.
5. To provide updated subject matter theoretically and practically which can enhance student's core competency and learning.
6. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
7. To enable the graduate to prepare for national as well as international competitive examinations, especially, IIT-JAM, UGC-CSIR NET, CUCET, GATE, GPSC, and UPSC Civil Services Examination.

COURSE INTRODUCTION

The redesigned curriculum of B.Sc. in Geology offers essential knowledge and technical skills to study earth in a holistic manner. Students would be exposed to different areas of earth science using a unique combination of core, elective and vocational papers with significant inter-disciplinary components. Students would be taught modern methods and technologies to understand dynamics of earth system & tectonics, minerals & rocks, geomorphology, stratigraphy, fossils science, natural recourses and its exploration techniques etc.

The entire programme of B.Sc. Geology will include classroom theories as well as practical field and laboratory component. The programme will also have field visits, study tours, outstations and field activities and projects as part of their curriculum.

Programme outcomes (POs):

Transformed curriculum shall develop educated outcome-oriented candidature, to develop into responsible citizen for nation-building and transforming the country towards the future with their knowledge gained in the field of earth science.

Programme specific objectives (PSOs): B.Sc. I Year Certificate Course in Geology

- ✓ This course will enable students to learn avenues in Geology.
- ✓ The first-year syllabus can help students to get ready for competitive exams.
- ✓ Students will be able to know about the basics of earth system science (i.e. formation of earth, its internal structure, atmosphere, and hydrosphere).
- ✓ Certificate and diploma courses are framed to generate self- entrepreneurship and self- employability, if multi exit option is opted.
- ✓ Students will increase the ability of critical thinking, reasoning and curiosity, development of scientific attitude, problem solving, improve practical skills, enhance communication skill, social interaction, and increase awareness in the field of earth science and environment.
- ✓ The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry at entry level.

TEACHING LEARNING PROCESS

Teaching and learning in this programme involve classroom lectures as well tutorials.

It allows-

- Closer interaction between the students and the teacher as each student gets individual attention.
- Preparation of assignments and projects submitted by students
- Project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Co-curricular activity etc.
- Study Tour or Field visit

EVALUATION METHODS:

Academic performance in various courses *i.e.* **Major, Minor, IDC/MDC, AEC. VAC** and **SEC** are to be considered as parameters for assessing the achievement of students in the subject. A number of appropriate assessment methods of Geology will be used to determine the extent to which students demonstrate desired learning outcomes.

Following assessment methodology should be adopted:

1. The oral and written examinations (Scheduled and surprise tests),
2. Field learning of students
3. Problem-solving exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports,
7. Efficient delivery using seminar presentations,
8. Viva voce interviews are majorly adopted assessment methods for this curriculum.
9. The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs form individual and collaborative work are also other important approaches for assessment purposes.
10. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (***Internal Evaluation***) as well as the **End of Semester examination** (***External Evaluation***). The weight-age of CCA shall be 50%, whereas the weight-age of the Semester end examination shall be 50%.
11. The **End of Semester examination** (***External Evaluation***) shall have an assessment based upon following perspective with respect to all the courses:

    a. Evaluation with respect to Knowledge,
    b. Evaluation with respect to Understanding,
    c. Evaluation with respect to Skill,
    d. Evaluation with respect to Application and
    e. Higher Order Thinking Skills.

- The End of Semester Examination will be conducted by the University. A certified journal of the respective practical course must be produced at the time of practical examination by the student. The Field Excursion is highly essential for studying

ological features. There shall be at least one field Excursion (local or outstation).

- This is compulsory to record laboratory work in the Journal. Certified journal has to be produced while appearing at the time of Practical examination

Year	Semester	Course Code	Paper Title	Credits	Marks		Total
					CA	UA	
First Year	I	MAJ GEO-101 (Theory)	Elementary Earth Science	3	35	40	75
		MAJ GEO-102-P (Practical)	As above (lab course)	1	10	15	25
		MAJ GEO-103 (Theory)	Oceanography and Atmospheric science	3	35	40	75
		MAJ GEO-104-P (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**8**	**Total Marks**		**200**
		MIN GEO-105 (Theory)	Elementary Earth Science	3	35	40	75
		MIN GEO-106-P (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**4**	**Total Marks**		**100**
		MDC GEO-107 (Theory)	Elementary Earth Science	3	35	40	75
		MDC GEO-108-P (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**4**	**Total Marks**		**100**
	II	MAJ GEO-201 (Theory)	Elementary Mineralogy and petrology	3	35	40	75
		MAJ GEO-202-P (Practical)	As above (lab course)	1	10	15	25

		MAJ GEO-203 (Theory)	Introduction to Physical Geology	3	35	40	75
		MAJ GEO-204 (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**8**	**Total Marks**		**200**
		MIN GEO-205 (Theory)	Elementary Mineralogy and petrology	3	35	40	75
		MIN GEO-206-P (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**4**	**Total Marks**		**100**
		MDC GEO-207 (Theory)	Elementary Mineralogy and petrology	3	35	40	75
		MIN GEO-208-P (Practical)	As above (lab course)	1	10	15	25
		Total Credits		**4**	**Total Marks**		**100**

Structure of the Question Paper for the University Exam

KSKV Kachchh University: BHUJ

FIRST YEAR B.Sc.: GEOLOGY THEORY (MAJOR/MINOR/MDC)

Total Marks: 40, Duration: 2 hours 30 min

Passing standard: 16 Marks

PATTERN OF QUESTION PAPER

FOR SEMESTER-END EXAMS (Sem I & II)

Questions	Section	Marks
Question – 1 Unit – 1	**2 Questions of 10 Marks, student have to attempt any 1**	**10 marks**
Question – 2 Unit –II	**–do-**	**10 marks**
Question – 3 Unit – III	**–do-**	**10 marks**
Question – 4	**12 short questions of 1 mark, 4 questions from each unit and the students have to attempt any 10.**	**10 Marks**

- Types of questions for Question 4 may be varied like: one-line answer / two-line answers / definitions / reasoning / drawing small figures/ label the figure / one word answer / match the pairs etc.

Note: Certified journal will be compulsory for University Practical Examination.

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students.

DETAILED SYLLABUS OF B.Sc. I YEAR (SEMESTER-II) FOR CERTIFICATE COURSE IN BASIC GEOLOGY

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Course Outcome

After the completion of the course the students will be able to:

1. Student will be introduced to Minerals and their formation.
2. Basic idea about mineral structure and chemical bonding and mineral classification.
3. Elementary study of physical properties of rock forming minerals and develop ability to identify different minerals in hand specimen.
4. Introduction to different types of rocks and concept of rock cycle
5. Students will be introduced to earthquake science.
6. Understanding origin and types of soils and soil profile.
7. Students will be introduced to geomorphic science and processes acts on earth surface.

SEMESTER 2:
Paper MAJ GEO-201: Elementary Crystallography, Mineralogy and petrology
(Course code: MAJ GEO-201) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Certificate Course	*B.Sc. II*	*MAJ GEO-201*	**Elementary Mineralogy and petrology**	**3**	**45**	*40 Marks*	*35 Marks*
UNIT	*TOPIC*						*No.Of Lectures* **(45 hrs)**
Unit 1	**Introduction to Mineralogy** • Definition and characteristics of mineral, rock forming and ore minerals. • Introduction to Dana System of Mineral Classification. • Introduction to Gem minerals.						**15**
Unit 2	**Minerals Properties** • Physical properties of minerals including Isomorphism, Polymorphism, Pseudomorphism, Chatoyancy and Asterism. • Electrical properties of minerals.						**15**
Unit 3	**Introduction to petrology:** • Elementary study of Igneous, metamorphic and sedimentary rocks • Origin and major characteristics of different types of rocks • Rock Cycle.						**15**

Suggested readings

•Rultey's Elements of Mineralogy 26th edition, H.H. Read
•Rultey's Elements of Mineralogy 27th edition, C.D Gribble
•Manual Mineralogy 21st edition, (after James D. Dana), Cornelis Klein, Cornelius S, Hurlbut, Jr.
•Mineral science 22th edition, (after James D. Dana), Cornelis Klein.
•Mineralogy 2nd edition, Dexter Perkins.
•A Text Book of Geology, P. K. Mukherjee, World press.

Note: Students may refer variety of material available online and on web resources for further understanding.

SKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MAJ GEO-202-P Elementary Mineralogy and petrology

Practical/ Lab course (Course code: MAJ GEO202-P)

Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1. Student will get basic understanding of formation and classification of minerals.
2. It will help them understand and develop skills for identifying minerals in hand specimen.
3. Learn observational skills in lab as well as field and demonstrate the same in journals and exams.
4. At first year basic level, they will learn the preparation of brief reports of their observations in field.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Certificate Course	**B.SC**	***MAJ GEO-202-P***	**Elementary Mineralogy and petrology**	**1**	**30 hrs**	***25 (15+10) Marks***

- Study of Mineral classification
- Study of the physical properties of the common rock forming minerals –

  Talc, Gypsum, Muscovite, Biotite, Calcite, Fluorite, Apatite, Orthoclase, Microcline, Plagioclase, Quartz, Amethyst, Chalcedony, Agate, Bloodstone, Flint, Jasper, Opal, Topaz, Corundum, Beryl, Garnet, Epidote, Chlorite, Asbestoses, Hornblende, Augite, Tourmaline, Olivine, Halite, Aragonite, Hypersthene.
- Study of types of clay.

Field Report/ Submission

SEMESTER 2:
Paper MAJ GEO-203: Introduction to Physical Geology
(Course code: MAJ GEO-203) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Certificate Course	*B.Sc. II*	*MAJ GEO-203*	**Introduction to Physical Geology**	**3**	**45**	*40 Marks*	*35 Marks*
UNIT	*TOPIC*						*No. Of Lectures* **(45hrs)**
	Earthquake science • Earthquakes– Definition, Mechanism of Earthquakes, • Seismic Waves, Scales of Earthquake, Earthquake Prediction. • Seismograph and Seismogram, • Effect of Earthquake, Seismic Belts, Relation between earthquakes, Volcanoes and Plate Tectonics.						**15**
	Soil • Introduction - Soil. • Basics of weathering. • Soil composition and soil profile. • Classification of soil. • Soil groups of India. • Soil erosion and conservation.						**15**
	Elementary Geomorphology • Definition and Scope • Basic geomorphological concepts. • Different cycles of erosion. • Rejuvenation and its causes. • Tools and Techniques in geomorphology. • Introduction to First, second and third order relief structure.						**15**

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MAJ GEO-204-P Introduction to Physical Geology

Practical/ Lab course (Course code: MAJ GEO-204-P)

Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1. Student will get basic understanding of formation and classification of minerals.
2. It will help them understand and develop skills for identifying minerals in hand specimen.
3. Learn observational skills in lab as well as field and demonstrate the same in journals and exams.
4. At first year basic level, they will learn the preparation of brief reports of their observations in field.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Certificate Course	**B.SC**	***MAJ* GEO-204-P**	**Introduction to Physical Geology**	**1**	**30 hrs**	***25 (15+10) Marks***

- Demarcation of major global seismic belts.
- Identification of seismic zone of India
- Locating earthquake epicenter with the help of provided data.
- Study of soil profile.
- Study of soil map of India
- Identification of geomorphic structures form satellite imageries and toposheets.

Note: Additional practical related to syllabus may be included during class work.

SEMESTER 2:
Paper MIN GEO-205: Elementary Crystallography, Mineralogy and petrology
(Course code: MIN GEO-205) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Certificate Course	*B.Sc. II*	*MIN GEO-205*	**Elementary Mineralogy and petrology**	**3**	**45**	*40 Marks*	*35 Marks*
UNIT	*TOPIC*						*No.Of Lectures* **(45 hrs)**
Unit 1	**Introduction to Mineralogy** • Definition and characteristics of mineral, rock forming and ore minerals. • Introduction to Dana System of Mineral Classification. • Introduction to Gem minerals.						**15**
Unit 2	**Minerals Properties** • Physical properties of minerals including Isomorphism, Polymorphism, Pseudomorphism, Chatoyancy and Asterism. • Electrical properties of minerals.						**15**
Unit 3	**Introduction to petrology:** • Elementary study of Igneous, metamorphic and sedimentary rocks • Origin and major characteristics of different types of rocks • Rock Cycle.						**15**

Suggested readings

•Rultey's Elements of Mineralogy 26th edition, H.H. Read
•Rultey's Elements of Mineralogy 27th edition, C.D Gribble
•Manual Mineralogy 21st edition, (after James D. Dana), Cornelis Klein, Cornelius S, Hurlbut, Jr.
•Mineral science 22th edition, (after James D. Dana), Cornelis Klein.
•Mineralogy 2nd edition, Dexter Perkins.
•A Text Book of Geology, P. K. Mukherjee, World press.

Note: Students may refer variety of material available online and on web resources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MIN GEO-206-P Elementary Mineralogy and petrology

Practical/ Lab course (Course code: MIN GEO206-P)

Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1. Student will get basic understanding of formation and classification of minerals.
2. It will help them understand and develop skills for identifying minerals in hand specimen.
3. Learn observational skills in lab as well as field and demonstrate the same in journals and exams.
4. At first year basic level, they will learn the preparation of brief reports of their observations in field.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Certificate Course	**B.SC**	***MIN* GEO-206-P**	**Elementary Mineralogy and petrology**	**1**	**30 hrs**	***25 (15+10) Marks***

- Study of Mineral classification
- Study of the physical properties of the common rock forming minerals –

  Talc, Gypsum, Muscovite, Biotite, Calcite, Fluorite, Apatite, Orthoclase, Microcline, Plagioclase, Quartz, Amethyst, Chalcedony, Agate, Bloodstone, Flint, Jasper, Opal, Topaz, Corundum, Beryl, Garnet, Epidote, Chlorite, Asbestoses, Hornblende, Augite, Tourmaline, Olivine, Halite, Aragonite, Hypersthene.
- Study of types of clay.

Field Report/ Submission

SEMESTER 2:
Paper MDC GEO-207: Elementary Crystallography, Mineralogy and petrology
(Course code: MDC GEO-207) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Certificate Course	*B.Sc. II*	*MDC GEO-207*	**Elementary Mineralogy and petrology**	**3**	**45**	*40 Marks*	*35 Marks*
UNIT	*TOPIC*						*No.Of Lectures* **(45 hrs)**
Unit 1	**Introduction to Mineralogy** • Definition and characteristics of mineral, rock forming and ore minerals. • Introduction to Dana System of Mineral Classification. • Introduction to Gem minerals.						**15**
Unit 2	**Minerals Properties** • Physical properties of minerals including Isomorphism, Polymorphism, Pseudomorphism, Chatoyancy and Asterism. • Electrical properties of minerals.						**15**
Unit 3	**Introduction to petrology:** • Elementary study of Igneous, metamorphic and sedimentary rocks • Origin and major characteristics of different types of rocks • Rock Cycle.						**15**

Suggested readings

•Rultey's Elements of Mineralogy 26th edition, H.H. Read
•Rultey's Elements of Mineralogy 27th edition, C.D Gribble
•Manual Mineralogy 21st edition, (after James D. Dana), Cornelis Klein, Cornelius S, Hurlbut, Jr.
•Mineral science 22th edition, (after James D. Dana), Cornelis Klein.
•Mineralogy 2nd edition, Dexter Perkins.
•A Text Book of Geology, P. K. Mukherjee, World press.

Note: Students may refer variety of material available online and on web resources for further understanding.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER II:

Paper MED GEO-208-P Elementary Mineralogy and petrology

Practical/ Lab course (Course code: MDC GEO208-P)

Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1. Student will get basic understanding of formation and classification of minerals.
2. It will help them understand and develop skills for identifying minerals in hand specimen.
3. Learn observational skills in lab as well as field and demonstrate the same in journals and exams.
4. At first year basic level, they will learn the preparation of brief reports of their observations in field.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***PRACTICAL***		
				Credits	***Lectures***	***INTERNAL/ External***
Certificate Course	**B.SC**	***MDC* GEO-208-P**	**Elementary Mineralogy and petrology**	**1**	**30 hrs**	***25 (15+10) Marks***

- Study of Mineral classification
- Study of the physical properties of the common rock forming minerals –

  Talc, Gypsum, Muscovite, Biotite, Calcite, Fluorite, Apatite, Orthoclase, Microcline, Plagioclase, Quartz, Amethyst, Chalcedony, Agate, Bloodstone, Flint, Jasper, Opal, Topaz, Corundum, Beryl, Garnet, Epidote, Chlorite, Asbestoses, Hornblende, Augite, Tourmaline, Olivine, Halite, Aragonite, Hypersthene.
- Study of types of clay.

Field Report/ Submission

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2023-24 UNDER NEP-2020)

SEMESTER 2

Course Title: Elementary Crystallography, Mineralogy and petrology

SKELETAL STRUCTURE OF INTERNAL PRACTICAL-*GEO-P-202*

Total Marks: 25 (15 internal + 10 External)

Instructions: Strictly follow the instructions given by examiner(s).	marks
1. Classify the mineral specimen according to mineral group.	**As per mineral asked**
2. Identify the Mineral specimen megascopically using physical properties in Group no. __ to ____.	**--do--**
3. Give the chemical composition, crystal system, origin and at least two uses	**--do--**
4. Journal submission/field reports and Viva-voce	**5 marks**

Note: Certified journal will be compulsory for University Practical Examination.

- Excursion/ Project work/ Visit/ Tour/ report and submission of specimens / Charts/ Model/ Fresh Material/ other activity (Given by teacher or as a part of Syllabus) will be mandatory for all the students.