KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY,
BHUJ.

Year: 2025-2026

B.Sc (Honours) Geology

(With Research /Without Research)

Semesters : V and VI
(Exit option)

FACULTY OF SCIENCE

SYLLABUS

Curriculum as per UGC Guideline
Framed according to National Education Policy (NEP) - 2020
With effect from June – 2025 (and thereafter)

Kranti Guru Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

B.Sc. (Honours) Geology Programme

(With Research/without Research)

NEP-2020

With effect from June – 2025 (and thereafter)

FACULTY OF SCIENCE

Subject: GEOLOGY

B. Sc. Semesters: V & VI

Kaviraja Shyamji Krishna Verma Kachchh University Bhuj-Kachchh 370001

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 of 1st Year	
2	Diploma in the Discipline	After successful completion of 1st and 2nd Years	
3	B.Sc. in Geology	After successful completion of 1st, 2nd and 3rd Years	
4	B.Sc. (Honours with Research/ without Research) in Geology	After successful completion of 1st, 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.

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

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. Third Year Course in Geology

- ✓ Develop comprehensive understanding of the origin, classification, and evolution of igneous, sedimentary, and metamorphic rocks, and apply petrological techniques in identifying rock types and their economic significance.
- ✓ Gain insights into sedimentary processes, basin analysis, and petroleum geology, equipping students to evaluate hydrocarbon systems and sediment-hosted resources.
- ✓ Learn about the formation, distribution, and exploration of ore deposits, and assess the economic importance of minerals for industrial and societal needs.
- ✓ Develop fundamental knowledge of surface and groundwater hydrology, enabling students to manage water resources and address hydrological challenges.

- ✓ Acquire practical skills in geological exploration techniques and apply remote sensing and GIS technologies for resource assessment and geological mapping.
- ✓ Interpret the geological history of India through its stratigraphic record, and recognize major stratigraphic units and their paleogeographic significance.
- ✓ Understand the diversity, evolution, and significance of invertebrate fossils, and utilize paleontological data for biostratigraphy and environmental reconstructions.
- ✓ Analyze large-scale earth processes and structures, and apply geological principles in solving engineering problems related to construction and land stability.
- ✓ Learn about mining methods, mine planning, and environmental impacts of mining activities, promoting sustainable practices in resource extraction.
- ✓ Demonstrate hands-on skills in geological fieldwork, rock and mineral identification, geological mapping, and report writing through intensive practical training.
- ✓ 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.
- Hands on training.

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.

Shyamji Krishna Verma Kanchi University BHUJ - Kachchh 370001

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 geological 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

Shivampreet Verma Kachchh University BHUJ - Kachchh 370001

Year	Semester	Course Code	Paper Title	Credits	Marks		Total
					CA	UA	
Third Year	V	MAJ GEO-501: (Theory)	IGNEOUS AND METAMORPHIC PETROLOGY	3	35	40	75
		MAJ GEO-502-P (Practical)	As above (lab course)	1	10	15	25
		MAJ GEO-503: (Theory)	SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY	3	35	40	75
		MAJ GEO-504-P (Practical)	As above (lab course)	1	10	15	25
		MAJ GEO-505 (Theory)	ORE GEOLOGY AND MINERAL ECONOMIC	3	35	40	75
		MAJ GEO-506-P (Practical)	As above (lab course)	1	10	15	25
		MIN GEO-507 (Theory)	HYDROGEOLOGY	3	35	40	75
		MIN GEO-508-P (Practical)	As above (lab course)	1	10	15	25
		MIN GEO-509 (Theory)	EXPLORATION GEOLOGY AND REMOTE SENSING	3	35	40	75
		MIN GEO-510-P (Practical)	As above (lab course)	1	10	15	25
		SEC GEO 511	Field Geology -Practical	2	25	25	50
	Total Credits			**22**	**Total Marks**		**550**
	VI	MAJ GEO-601 (Theory)	Indian Stratigraphy	3	35	40	75
		MAJ GEO-602-P (Practical)	As above (lab course)	1	10	15	25
		MAJ GEO-603 (Theory)	INVERTEBRATE PALEONTOLOGY	3	35	40	75
		MAJ GEO-604 (Practical)	As above (lab course)	1	10	15	25
		MAJ GEO-605 (Theory)	GEOTECTONICS AND ENGINEERING GEOLOGY	3	35	40	75

Pandit Shri Krishna Verma Kachchh University
BHUJ - Kachchh
370001

		MAJ GEO-606-P (Practical)	As above (lab course)	1	10	15	25
		MIN GEO-607 (Theory)	Mining and Environmental Geology	3	35	40	75
		MIN GEO-608-P (Practical)	As above (lab course)	1	10	15	25
		IN GEO-609 (Internship)	Internship in Geology (Major specific subject)	4	40	60	100
	Total Credits			**20**	**Total Marks**		**500**

Krantiguru Shyamji Krishna Verma Kachchh University GHU - Kachchh 370001

Structure of the Question Paper for the University Exam

KSKV Kachchh University: BHUJ

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

Total Marks: 40, Duration: 2 hours

Passing standard: 16 Marks

PATTERN OF QUESTION PAPER

FOR SEMESTER-END EXAMS (Sem V & VI)

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.

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

DETAILED SYLLABUS OF B.Sc. 3rd YEAR FOR DEGREE COURSE IN GEOLOGY

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER -V:

Paper MAJ GEO-501: IGNEOUS AND METAMORPHIC PETROLOGY

(Course code: MAJ GEO-501) Credit: 3

Course Outcome

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

1. Understand the types, properties, and physical behavior of magma, and explain the formation and growth of igneous textures and minerals.
2. Analyze the crystallization behavior of minerals in unicomponent, binary, and ternary systems using phase diagrams and apply the phase rule to magmatic processes.
3. Classify igneous rocks using standard chemical, mineralogical, and IUGS classification schemes, and interpret magmatic series like tholeiitic, calc-alkaline, and alkaline types.
4. Relate the occurrence and distribution of igneous rocks to plate tectonic settings and infer tectono-magmatic environments.
5. Identify metamorphic rocks based on index minerals, metamorphic zones, and isograds, and understand the concept of metamorphic facies and grade.
6. Interpret the textures and structures of metamorphic rocks to deduce their metamorphic history and recognize different types of metamorphism affecting various rock types.
7. Develop skills of presentations and narration using computer & multimedia.

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370021

SEMESTER-V:
Paper: *MAJ GEO-501*: IGNEOUS AND METAMORPHIC PETROLOGY
(Course code: MAJ GEO-501) Credit: 3

GEOLOGY SPECIFIC CORE COURSE							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSETITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	**B.Sc.-V**	***MAJ GEO-501***	**IGNEOUS AND METAMORPHIC PETROLOGY**	**3**	**45**	***40 Marks***	***35 Marks***

UNIT	*TOPIC*	*No. Of Lectures* (45 hrs)
Unit 1	• Magma, Types of magma and physical properties of magma. • Textures of Igneous rocks; Crystallinity, granularity, shapes and mutual relations of grains; nucleation and growth of igneous minerals. • Pyrogenetic minerals – Ortho-, meta- and poly silicates. • Phase rule and its application to eutectic and solid solution system. • Understanding crystallization of unicomponent, binary and tertiary systems.	**15**
Unit 2	• Standard classification schemes; chemical and mineralogical classifications, tabular and IUGS classification. • Evolution of magmas and petrographic types: tholeiitic, calc-alkaline, and alkaline series. • Basic ideas about occurrence of igneous rocks and petrographic types with reference to plate tectonics.	**15**
Unit 3	• Index minerals, metamorphic zones and isograds. • Concept of metamorphic facies and grade. • Structure and textures of metamorphic rocks. • Regional and contact metamorphism of argillaceous, calcareous, quartzo-felspathic and basic igneous rocks.	**15**

Suggested readings

- Winter, J. D. (2014). Principles of igneous and metamorphic petrology. Pearson.
- Turner, F.J. & Verhoogen, J., 1960, Igneous & Metamorphic petrology. McGraw Hill Co.
- Bose, M.K., 1997. Igneous petrology. World press
- Tyrell, G. W., 1989. Principles of Petrology. Methuren and Co (Students ed.).
- Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.

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

Shyamji Krishna Verma Kachchh University ☆ BHUJ - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER-V:

Paper MAJ GEO-502-P: IGNEOUS AND METAMORPHIC PETROLOGY

Practical/ Lab course (Course code: MAJ GEO-502-P)
Credit: 1

Course Outcome

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

1. Identify and describe key igneous rocks through hand specimen and thin section study.
2. Interpret the mineralogical composition, texture, and classification of igneous rocks under the microscope.
3. Recognize important metamorphic rocks in hand specimens and thin sections.
4. Develop practical skills in petrographic microscopy, hand specimen analysis, and systematic rock description for both igneous and metamorphic rocks.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.Sc -V**	*MAJ GEO-502-P*	**IGNEOUS AND METAMORPHIC PETROLOGY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Study of important igneous rocks in hand specimens and thin sections- granite, granodiorite, diorite, gabbro, anorthosites, ultramafic rocks, basalts, andesites, trachyte, rhyolite.
- Study of important Metamorphic rocks in hand specimens and thin sections; schists, gneiss, quartzite, marble.

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

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER -V:

Paper MAJ GEO-503: SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY

(Course code: MAJ GEO-503) Credit: 3

Course Outcome

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

1. Understand the origin, transportation, and deposition of sediments by analyzing grain size, particle shape, packing, and fluid flow dynamics.
2. Explain sedimentary structures, both primary and biogenic, and interpret depositional processes based on sediment transport and flow regimes.
3. Describe penecontemporaneous deformation structures, sedimentary facies, and facies models, applying Walther's Law to interpret stratigraphic successions.
4. Classify and describe conglomerates, sandstones, and limestones, and relate their properties to depositional environments.
5. Explain the origin, maturation, and generation of petroleum from organic matter, including chemical and physical characteristics of crude oils.
6. Characterize petroleum reservoirs based on porosity, permeability, and fluid saturation, and differentiate between structural, stratigraphic, and combination hydrocarbon traps.
7. Describe the role of cap rocks in petroleum accumulation and assess their types and sealing properties.
8. Develop skills of presentations and narration using computer & multimedia.

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

SEMESTER-V:
Paper: MAJ GEO-503: SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY
(Course code: MAJ GEO-503) Credit: 3

GEOLOGY SPECIFIC CORE COURSE							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	**B.Sc.-V**	*MAJ GEO-503*	*SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY*	**3**	**45**	*40 Marks*	*35 Marks*
UNIT	*TOPIC*						*No. Of Lectures* (45 hrs)
Unit 1	• Origin of sediments, Grain size scale, particle size distribution. • Particle shape, roundness, sphericity, and packing fabric • Introduction to fluid flow in sediment transport • Flow rheology, flow regime, laminar and turbulent flow. • Particle entrainment in fluid flow. • Sedimentary structure: Primary and Biogenic sedimentary structures.						**15**
Unit 2	• Penecontemporaneous deformation structures. • Concept of sedimentary facies and facies models • Walther's Law and its applications in stratigraphic interpretation. • Overview of different depositional environments. • Classification and description of conglomerates, sandstones and Limestones.						**15**
Unit 3	• Origin of petroleum: organic matter sources, maturation, and hydrocarbon generation • Chemical composition and physical properties of crude oils. • Petroleum reservoirs: characteristics of reservoir rocks (porosity, permeability, fluid saturation) • Hydrocarbon traps: definitions and significance • Classification of hydrocarbon traps: Structural traps, Stratigraphic traps, Combination traps. • Cap rocks: definition, types, and sealing capacity						**15**

Suggested readings

- Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.
- Pettijohn, F.J., 1975. Sedimentary rocks, Harper & Bros. 3rd Ed.
- Shelly R. C. (2014). Elements of Petroleum geology: Third Edition, Academic Press
- Bjorlykke, K. (1989). Sedimentology and petroleum geology. Springer-Verlag.

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

Shri Krishna Vishwa Kachchh University BHUJ - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER-V:

Paper MAJ GEO-504-P: SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY

Practical/ Lab course (Course code: MAJ GEO-504-P)
Credit: 1

Course Outcome

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

1. Identify and classify clastic and non-clastic sedimentary rocks through the study of hand specimens and thin sections.
2. Analyze sedimentary textures, structures, and mineralogical compositions to interpret depositional environments.
3. Determine porosity and permeability of reservoir rocks and assess their significance for petroleum exploration.
5. Locate and mark major onshore and offshore petroleum basins on maps, demonstrating basic geographic and geological mapping skills.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.SC -V**	*MAJ GEO-504-P*	*SEDIMENTARY PETROLOGY AND PETROLEUM GEOLOGY*	**1**	**30 hrs**	*25 (10+15) Marks*

- Petrography of clastic and non-clastic rocks through hand specimens and thin sections.
- Determination of porosity and permeability of the reservoir rocks.
- Draw and describe various types of petroleum traps.
- Plotting of major petroleum basins (both onshore and offshore) on the given map

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

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.

Shyamji Krishna Verma Kachchh University ☆ Kranti Guru
BHUJ - Kachchh
370001

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER -V:
Paper MAJ GEO-505: ORE GEOLOGY AND MINERAL ECONOMIC

(Course code: MAJ GEO-505) Credit: 3

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

1. Understand the meaning, characteristics, and historical development of mineral deposits, and explain concepts like ore grade, tenor, and resource-reserve estimation.
2. Classify mineral deposits based on their genesis and economic importance.
3. Explain the processes involved in the formation of magmatic, metasomatic, skarn, hydrothermal, greisen, residual, supergene enriched, placer, evaporite, sedimentary, and metamorphic mineral deposits.
4. Understand the concepts of metallogenic provinces and epochs and their significance in global and Indian mineral distribution.
5. Explain the origin, classification, stages of formation, and distribution of coal in India, and introduce the concept of Coal Bed Methane (CBM).
6. Identify and describe the occurrence, mineralogy, and distribution of major metallic, non-metallic, atomic, and industrial mineral resources in India.
7. Develop skills of presentations and narration using computer & multimedia.

Krishna Verma Kachchh University BHUJ - Kachchh 370001

SEMESTER-V:

Paper MAJ GEO-505: ORE GEOLOGY AND MINERAL ECONOMIC

(Course code: MAJ GEO-505) Credit: 3

GEOLOGY SPECIFIC CORE COURSE							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	**B.Sc.-V**	*MAJ GEO-505*	*ORE GEOLOGY AND MINERAL ECONOMIC*	**3**	**45**	*40 Marks*	*35 Marks*

UNIT	*TOPIC*	*No. Of Lectures* (45 hrs)
Unit 1	• Mineral Deposits: Meaning, Specialties and History. • Ore grade, tenor and Specification • Concept mineral resource and reserve estimation. • Classification of Mineral deposits	**15**
Unit 2	• Magmatic concentration, Metasomatism and skarns deposits. • Hydrothermal deposits and Greisen's, • Weathering products and residual deposits, oxidation and supergene enrichment, placer deposits. • Deposits formed by evaporation, sedimentation and metamorphism.	**15**
Unit 3	• Metallogenic Provinces and Epochs. • Definition and origin of Coal, Basic classification of coal. Stages in Coal Formation, Occurrence and Distribution in India. • Introduction to Coal Bed Methane (CBM) • Important mineral deposits of India including Metallic, Non-metallic, atomic minerals, and industrial rocks and minerals their mineralogy, occurrence and distribution in India.	**15**

Suggested readings

- Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
- Jense, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
- Krishnnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
- Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributers.
- Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.

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

Kranti Jyoti Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER-V:
Paper MAJ GEO-506-P: ORE GEOLOGY AND MINERAL ECONOMIC

Practical/ Lab course (Course code: MAJ GEO-506-P)
Credit: 1

Course Outcome

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

1. Identify and describe important ore minerals and economic minerals in hand specimens based on their physical properties.
2. Differentiate metallic and non-metallic minerals through mineralogical and economic characteristics.
3. Prepare geological maps showing the distribution of major metallic and non-metallic mineral deposits in India.
4. Develop foundational skills in mineral identification, map preparation, and spatial interpretation of mineral and energy resources.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.Sc -V**	*MAJ GEO-506-P*	**Elementary Earth Science**	**1**	**30 hrs**	*25 (10+15) Marks*

- Study of ore and economic minerals in hand specimen.
- Preparation of maps showing distribution of important metallic and non-metallic deposits and important coal fields of India.

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

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER -V:

Paper DS MIN GEO-507: HYDROGEOLOGY

(Course code: DS MIN GEO-507) Credit: 3

Course Outcome

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

1. Understand the scope, importance, and societal relevance of groundwater and describe the components of the hydrologic cycle.
2. Explain the origin, genetic classification, and vertical distribution of groundwater, including the role of geomorphic and geological controls on groundwater occurrence.
3. Classify aquifers and explain related concepts such as the water table, piezometric surface, and the significance of springs.
4. Identify groundwater provinces of India and analyze how rock properties like porosity and permeability influence groundwater movement and storage.
5. Apply Darcy's Law to groundwater flow, and explain key hydrogeological properties like specific yield, specific retention, storativity, hydraulic conductivity, and transmissivity.
6. Understand groundwater flow rates, directions, and basic concepts of well hydraulics and drilling methods.
7. Develop skills of presentations and narration using computer & multimedia.

Krantiguru Shyamji Krishna Verma Kachchh University ☆ BHUJ - Kachchh 370001

SEMESTER-V:

Paper MIN GEO-507: HYDROGEOLOGY

(Course code: MIN GEO -507) Credit: 3

GEOLOGY (DISCIPLINE) SPECIFIC MINOR COURSE							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	B.Sc.-V	MIN GEO -507	*HYDROGEOLOGY*	3	45	*40 Marks*	*35 Marks*

UNIT	*TOPIC*	*No. Of Lectures* (45 hrs)
Unit 1	• Scope and societal relevance of ground water, Groundwater resources, water resource. • Hydrologic cycle: precipitation, evapo-transpiration, run-off, infiltration and groundwater flow. • Genetic classification of groundwater. • Basic concept of hydrographs, • Origin of groundwater, vertical distribution of subsurface water. • Geomorphic and geologic controls of groundwater occurrences.	15
Unit 2	• Types of aquifers: unconfined, confined, semi-confined, perched • Concept of water table and piezometric surface. • Springs and their significance. • Groundwater provinces in India. • Rock properties affecting groundwater- porosity, permeability,	15
Unit 3	• Darcy's law and its validity, specific retention and storage coefficient; specific yield, specific storage and storativity. • Groundwater flow rates and flow direction; Groundwater velocity, Intrinsic permeability and hydraulic conductivity, transmissivity, measurement of hydraulic conductivity. • Introduction to well hydraulics and drilling methods.	15

Suggested readings

- Todd, D. K. 2006. Groundwater hydrology, 2nd Ed., John Wiley & Sons, N.Y.
- Davis, S. N. and De Weist, R.J.M. 1966. Hydrogeology, John Wiley & Sons Inc., N.Y.
- Karanth K.R., 1987, Groundwater: Assessment, Development and management, Tata McGraw-Hill Pub. Co. Ltd.

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

Krantiguru Shyamji Krishna Verma Kachchh University - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER-V:
Paper MIN GEO -508-P: HYDROGEOLOGY

Practical/ Lab course (Course code: MIN GEO -508-P)
Credit: 1

Course Outcome
After the completion of the course the students will be able to:
1. Prepare and interpret water level contour maps and depth-to-water level maps to analyze groundwater conditions.
2. Understand groundwater flow patterns and apply basic principles of well hydraulics in hydrogeological studies.
3. Solve simple numerical problems related to aquifer properties such as porosity, permeability, specific yield, and transmissivity.
4. Construct and interpret subsurface hydrogeological profiles to understand groundwater occurrence and aquifer geometry.
5. Develop technical skills in hydrogeological data analysis, mapping, and basic groundwater modeling.

GEOLOGY (DISCIPLINE) SPECIFIC MINOR COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.Sc -V**	*DS MIN GEO -508-P*	**HYDROGEOLOGY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Preparation and interpretation of water level contour maps and depth to water level maps.
- Groundwater flow, Well hydraulics
- Simple numerical problems related to aquifer properties.
- Construction of Subsurface hydrogeological profile.

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

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER -V:
Paper MIN GEO-509: EXPLORATION GEOLOGY AND REMOTE SENSING

(Course code: MIN GEO-509) Credit: 3

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

1. Explain the interrelationship between geology and geophysics, and describe the principles and applications of major geophysical exploration methods such as gravity, magnetic, electrical, and seismic techniques.
2. Interpret geophysical anomalies and corrections to analyze subsurface geological features.
3. Understand the basic concepts and definitions of remote sensing, including electromagnetic spectrum utilization and radiation principle.
4. Explain the interaction of energy with the atmosphere and Earth's surface, and interpret spectral reflectance patterns for different surface materials like vegetation, soil, and water.
5. Differentiate between various remote sensing platforms (terrestrial, aerial, and spaceborne) and understand satellite systems, sensors, and scanners used in geological studies.
6. Apply remote sensing techniques for geological mapping, mineral exploration, and environmental studies.
7. Develop skills of presentations and narration using computer & multimedia.

SEMESTER-V:

Paper MIN GEO-509: EXPLORATION GEOLOGY AND REMOTE SENSING

(Course code: MIN GEO -509) Credit: 3

GEOLOGY (DISCIPLINE) SPECIFIC MINOR COURSE							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	**B.Sc.-V**	**MIN GEO -509**	***EXPLORATION GEOLOGY AND REMOTE SENSING***	**3**	**45**	***40 Marks***	***35 Marks***

UNIT	*TOPIC*	*No. Of Lectures* (45 hrs)
Unit 1	• Interrelationship between geology and geophysics • Introduction to geophysical exploration • Principles and applications of major geophysical methods: • Gravity method; Principle, anomalies, corrections, applications. • Magnetic method: Earth's magnetic field, magnetic anomalies, applications. • Electrical method: resistivity, self-potential, applications of electrical method. • Seismic method: refraction and reflection, source and receivers, types of shooting, applications.	**15**
Unit 2	• Concept and definition of remote sensing • Electromagnetic (EM) spectrum: types of EM radiation used in remote sensing. • Energy sources and radiation principles, Energy interaction with atmosphere: absorption, scattering, and transmission • Energy interaction with Earth's surface features: reflection, absorption, and emission • Spectral reflectance curves: vegetation, soil, and water, and Spectral response patterns for different surface materials.	**15**
Unit 3	• Remote sensing platforms: Terrestrial, Aerial, Spaceborne. • Types of satellites. • Satellites and their characteristics • Introduction to Sensor system and scanners • Ideal remote sensing system vs. characteristics of real remote sensing systems • Applications of remote sensing in geology.	**15**

Suggested readings

- Outlines of Geophysical Prospecting - A manual for geologists by Ramachandra Rao, M.B., Prasaranga, University of Mysore, Mysore, 1975.
- Exploration Geophysics - An Outline by Bhimasarikaram V.L.S., Association of Exploration Geophysicists, Osmania University, Hyderabad, 1990.
- Dobrin, M.B. (1984) An introduction to Geophysical Prospecting. McGraw-Hill, New Delhi.
- Lillesand, T. M. & Kiefer, R.W., 2007. *Remote Sensing and Image Interpretation*, Wiley.
- Richards, J.A. and Jia, X., 1999. Remote Sensing Digital Image Analysis, Springer-Verlag

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

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER-V:
Paper MIN GEO -510-P: EXPLORATION GEOLOGY AND REMOTE SENSING

Practical/ Lab course (Course code: MIN GEO -510-P)
Credit: 1

Course Outcome

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

1. Read and interpret topographic maps and prepare topographic profiles for geological analysis.
2. Analyze and interpret aerial photographs/satellite imageries to identify rock types (sedimentary, igneous, and metamorphic) and various geomorphic landforms such as aeolian, glacial, fluvial, and marine features.
3. Solve simple numerical problems related to basic geophysical methods and principles applied in exploration geology.
4. Develop practical skills in map reading, remote sensing interpretation, and basic geophysical problem-solving for geological investigations.

GEOLOGY (DISCIPLINE) SPECIFIC MINOR COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.Sc -V**	*MIN GEO -510-P*	**EXPLORATION GEOLOGY AND REMOTE SENSING**	**1**	**30 hrs**	*25 (10+15) Marks*

- Reading topographic maps. Preparation of topographic profile.
- Aerial Photo interpretation, identification of sedimentary, igneous and metamorphic rocks and various aeolian, glacial, fluvial and marine landforms.
- Simple numerical problems related to geophysics.

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

Journal / Submission

- Note: It is compulsory to record laboratory work (all the practicals) in the journal. The journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal must be produced while appearing at the time of Practical examination.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER-V:
Paper SEC GEO -511-P: Field Geology -Practical

Practical/ Lab course (Course code: SEC GEO -511-P)
Credit: 1

Course Outcome
After the completion of the course the students will be able to:
1. Accurately identify and interpret primary and secondary geological structures in the field.
2. Demonstrate proficiency in using clinometers and Brunton compasses for measuring the orientation of geological features.
3. Prepare detailed geological maps based on field observations and data collection.
4. Recognize and describe major structural features in field settings.
5. Construct lithologs and systematically document sedimentary features through direct field observation.
6. Effectively record, organize, and present field data through maps, notebooks, and technical field reports.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.Sc -V**	***SEC GEO -511-P***	**Field Geology - Practical**	**2**	**60 hrs**	***50 (25+25) Marks***

- Identification of primary and secondary structures in field.
- Clinometer and Brunton compass: use of the instruments in measuring geological data in field. Techniques of measurement of orientation data in field.
- Identification and characterization of major structural features in field.
- Preparation of Litholog.
- Preparation of a Geological map of a small area.
- Visit to one open crust mine; mining operation, surface geological expression of mining site.
- Recording field data in maps and notebooks.
- Report writing.

Report Submission/Journal Submission

- Note: The report /Journal is to be certified by the incharge teacher and the Head of the Department within time frame. Certified journal/report must be produced while appearing at the time of Practical examination.

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2025-26 UNDER NEP-2020)

SEMESTER V:

B. Sc.: SKELETAL STRUCTURE FOR PRACTICAL

Total Marks: 25 (10 internal + 15 External)

Instructions: Strictly follow the instructions given by examiner(s).	marks
1. Draw/Demonstrate/ Identify the specimen & explain etc...	**As per the question asked / specimen displayed**
2. Do as directed.	**--do--**
3. Journal submission/field reports and Viva-voce	

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 faculty or as a part of Syllabus) will be mandatory for all the students.