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 -VI:

Paper MAJ GEO-601: INDIAN STRATIGRAPHY

(Course code: MAJ GEO-601) Credit: 3

Course Outcome

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

1. Understand fundamental concepts of lithostratigraphy, biostratigraphy, chronostratigraphy, seismic stratigraphy, chemostratigraphy, magnetostratigraphy, and sequence stratigraphy.
2. Illustrate the geological framework of the Indian Shield and Proterozoic basins, including key cratons and sedimentary basins such as the Dharwar Craton, Aravalli-Bundelkhand Craton, Delhi Supergroup, Cuddapah, and Vindhyan basins.
3. Interpret the stratigraphy and palaeogeographic significance of Paleozoic sequences in the Salt Range, Spiti, and Kashmir.
4. Analyze the distribution, stratigraphy, structural features, and economic resources of the Gondwana Supergroup.
5. Understand major geological boundary events such as the Permian-Triassic (P-T) and Cretaceous-Tertiary (K-T) boundaries.
6. Evaluate the Mesozoic and Cenozoic stratigraphy of India, including Triassic rocks of Spiti, Jurassic rocks of Kachchh, Cretaceous rocks of Trichinapally and Narmada Basin, and the Deccan Trap volcanism along with its related sedimentary beds.
7. Discuss the stratigraphy and tectonic significance of the Siwalik Group and Karewas of Kashmir, and understand the evolution and tectonic divisions of the Himalayas.
8. Develop skills of presentations and narration using computer & multimedia.

SEMESTER-VI:
Paper MAJ GEO-601: INDIAN STRATIGRAPHY
(Course code: MAJ GEO-601) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	*B.Sc. VI*	*MAJ GEO-601*	**INDIAN STRATIGRAPHY**	**3**	**45**	*40 Marks*	*35 Marks*

UNIT	*TOPIC*	*No.Of Lectures* (45 hrs)
Unit 1	• Introduction to the concepts of lithostratigraphy, biostratigraphy, chronostratigraphy, seismic stratigraphy, chemostratigraphy, Magnetostratigraphy, and Sequence stratigraphy. • Introduction to the physiographic and tectonic subdivisions of India and Gujarat State. • Introduction to Indian Shield and Proterozoic basins of India. • Geology of Archean and Proterozoic basins of India; Dharwar craton, Arravalli-Bundelkhand craton, Delhi super group, Cuddapha and Vindhyan basin.	**15**
Unit 2	• Palaeozoic rocks of Salt range, Spiti and Kashmir. • Distribution, stratigraphy, structure and economic importance of Gondwana Super group. • Introduction to P-T Boundary and K-T Boundary.	**15**
Unit 3	• Triassic rocks of Spiti, Jurassic rocks of Kachchh, • Cretaceous rocks of Trichinapally and Narmada basin, • Deccan Trap Formation, Intertrappean and Infratrappean beds. • Tertiary rocks of Siwalik Group, Karewas of Kashmir. • Evolution and tectonic divisions of Himalayas.	**15**

Suggested readings

- Krishnan, M. S. (1982) Geology of India and Burma, CBS Publishers, Delhi
- Ramakrishnan, M. &Vaidyanadhan, R. (2008) Geology of India Volumes 1 & 2, Geological society of India, Bangalore.
- Valdiya, K. S. (2010) The making of India, Macmillan India Pvt. Ltd.
- Ravindra Kumar, 1985. Fundamentals of Historical Geology & Stratigraphy of India. Wiley Eastern.

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

KSKV Kachchh University, Bhuj - Kachchh

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

SEMESTER-VI:

Paper MAJ GEO-602-P INDIAN STRATIGRAPHY

Practical/ Lab course (Course code: MAJ GEO 602-P)

Credit: 1

Course Outcome

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

1. Analyze and interpret the geological map of India, identifying major stratigraphic units and their distribution.
2. Construct and interpret paleogeographic maps representing Precambrian geological time.
3. Evaluate and understand the reconstruction of Proterozoic supercontinents based on geological evidences.
4. Analyze the formation, configuration, and significance of the Pangea supercontinent in Earth's geological history.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL / External*
Degree Course	**B.SC-VI**	*MAJ GEO-602-P*	**INDIAN STRATIGRAPHY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Study of geological map of India and identification of major stratigraphic units.
- Study of rocks in hand specimens from known Indian stratigraphic horizons
- Drawing various paleogeographic maps of Precambrian time
- Study of different Proterozoic supercontinent reconstructions.
- Study of Pangea supercontinent reconstructions.

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 -VI:
Paper MAJ GEO-603: INVERTEBRATE PALEONTOLOGY

(Course code: MAJ GEO-603) Credit: 3

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

1. Understand the functional morphology, classification, geological distribution, evolutionary trends, and stratigraphic significance of Bivalvia, Gastropoda, and Cephalopoda.
2. Describe the functional morphology, classification, geological distribution, evolutionary trends, and stratigraphic significance of Trilobites, Graptolites, and Brachiopods.
3. Analyze the morphology, classification, and geological distribution of Cnidaria, Echinoidea, and Crinoidea, and explain the formation and types of coral reefs.
4. Demonstrate a basic understanding of micropaleontology and its applications in geological studies.
5. Develop skills of presentations and narration using computer & multimedia.

SEMESTER-VI:
Paper MAJ GEO-603: INVERTEBRATE PALEONTOLOGY
(Course code: MAJ GEO-603) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	*B.Sc. VI*	*MAJ GEO-603*	**INVERTEBRATE PALEONTOLOGY**	**3**	**45**	*40 Marks*	*35 Marks*

UNIT	*TOPIC*	*No. Of Lectures* (45hrs)
Unit 1	• Functional morphology, classification, geological distribution, evolutionary trend and stratigraphic significance of Bivalvia, Gastropoda and Cephalopoda.	**15**
Unit 2	• Functional morphology, classification, geological distribution, evolutionary trend and stratigraphic significance of Trilobite, Graptolites and Brachiopoda.	**15**
Unit 3	• Morphology, classification and geological distribution of Cnidaria, Echinoidea and Crinoidea, Coral reefs and their types. • Introduction to micropaleontology. • Introduction to Ichnology and its significance. • Ethological classification of trace fossils and study of common ichnogenera.	**15**

Suggested readings

- Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
- Swinerton, HH., 1961. Outlines of Paleontology. Edward Arnold Publishers
- Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution. Vishal Publ.
- Lehmann, U., 1983. Fossil Invertebrate. Cambridge Univ. 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 2025-26 UNDER NEP-2020)

SEMESTER-VI:

Paper MAJ GEO-604-P INVERTEBRATE PALEONTOLOGY

Practical/ Lab course (Course code: MAJ GEO-604-P)

Credit: 1

Course Outcome

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

1. Identify and describe morphological characteristics of key invertebrate fossils from major phyla across different geological eras.
2. Determine the systematic position and geological age of various fossil specimens through practical exercises.
3. Develop skills in fossil classification, interpretation, and application of paleontological data to geological studies.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL / External*
Degree Course	**B.SC-VI**	*MAJ* **GEO 604-P**	**INVERTEBRATE PALEONTOLOGY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Study of morphological characters of various invertebrates representing important phyla belonging to different geological eras.
- Study of common ichnogenera.
- Exercise on systematic position and age of fossil.

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 -VI:

Paper MAJ GEO-605: GEOTECTONICS AND ENGINEERING GEOLOGY

(Course code: MAJ GEO-605) Credit: 3

Course Outcome

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

1. Differentiate between continental and oceanic lithosphere and explain volcanic processes and Earth's heat flow, magnetic field, geomagnetism, paleomagnetism, and concepts of isostasy
2. Understand the principles of plate tectonics, including the Wilson cycle, and identify the types, characteristics, and geological features associated with different plate boundaries.
3. Learn the concepts of hotspots, mantle plumes, plate boundary motions, rates of plate movement, and features such as triple junctions, volcanic arcs, island arcs, trenches, accretionary prisms, oceanic ridges, and transform faults.
4. Understand the role of engineering geologists in the planning, design, and construction of major structures, and assess the engineering properties of rocks, soils, and construction materials.
5. Apply site investigation and site improvement techniques, including grouting, rock bolting, and support mechanisms, for construction projects.
6. Evaluate the basic geotechnical aspects of dam and tunnel construction, including terminology, types, objectives, site selection criteria, and geological challenges.
7. Develop skills of presentations and narration using computer & multimedia.

SEMESTER-VI:
Paper MAJ GEO-605: GEOTECTONICS AND ENGINEERING GEOLOGY
(Course code: MAJ GEO-605) Credit: 3

DISCIPLINE SPECIFIC CORE COURSES (MAJOR)							
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	THEORY			
				Credits	Lectures	External	Internal
Degree Course	B.Sc. VI	MAJ GEO-605	GEOTECTONICS AND ENGINEERING GEOLOGY	3	45	40 Marks	35 Marks

UNIT	TOPIC	No. Of Lectures (45 hrs)
Unit 1	• Continental and oceanic lithosphere. • Volcano and volcanism. • Earth's heat flow, Earth magnetic field and Geomagnetism, paleomagnetism, Isostasy. • Concept of plate and Plate tectonic system; Wilson cycle. • Plate boundaries: types, character, Identification of boundaries.	15
Unit 2	• Hotspots and Mantle plumes. • Motion along plate boundaries, Rate of plate motion, Triple Junction. • Volcanic arcs, island arcs, trenches, accretionary prisms, oceanic ridges, transform faults. • Magmatism in oceanic ridges and in subduction zones.	15
Unit 3	• Introduction Role of Engineering geologists in planning, design and construction of major man-made structures. • Engineering properties of rocks and soil, Rock aggregates, Construction materials. • Site investigations and site improvement techniques; Grouting, Rock Bolting and other support mechanisms. • Basic geotechnical aspects of constructions of dams and tunnels; Terminology, Types, Objectives, Site selection criteria, Geological problems associated.	15

Suggested readings

- Kearey, p., Klepeis, K. A., and Vine, F. J. (2009). Global Tectonics. Third edition. Wiley-Blackwell, Oxford.
- Condie, K.C. (1997). Plate Tectonics and Crustal Evolution. Fourth edition. Butterworth-Heinemann.
- Moores, E. M. and Twiss, R. J. (1995). Tectonics. W. H. Freeman, New York.
- Krynine D.P. and Judd W.R., 1957. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
- Kesavulu, N.C., 2009. A text book of engineering geology. Macmillan P publishing India Ltd.

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

KSKV Kachchh University, Bhuj - Kachchh

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

SEMESTER VI:

Paper MAJ GEO-606-P GEOTECTONICS AND ENGINEERING GEOLOGY

Practical/ Lab course (Course code: MIN GEO 606-P)

Credit: 1

Course Outcome

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

1. Illustrate major tectonic features through block diagrams and cross-sectional constructions.
2. Interpret and analyze the geometry and structure of various tectonic settings.
3. Evaluate the geotechnical properties of rocks, natural aggregates, and soils through practical exercises.
4. Apply basic geological and engineering principles to solve problems related to construction and site analysis.

DISCIPLINE SPECIFIC CORE COURSE						
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*PRACTICAL*		
				Credits	*Lectures*	*INTERNAL/ External*
Degree Course	**B.SC-VI**	*MAJ* **GEO-606-P**	**GEOTECTONICS AND ENGINEERING GEOLOGY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Geometry of plate tectonics: Drawing of block diagrams depicting tectonic features.
- Construction of cross sections to understand various tectonic features.
- Exercises on geotechnical properties of rocks, natural aggregates and soils.

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 -VI:
Paper MIN GEO-607: MINING AND ENVIRONMENTAL GEOLOGY

(Course code: MIN GEO-607) Credit: 3

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

1. Learn the objectives, significance, and different stages of mining, including exploration, development, exploitation, and reclamation.
2. Classify and describe various mining methods, distinguishing between open-cast and underground techniques.
3. Understand the fundamental concepts and principles of environmental geology.
4. Identify natural environmental hazards such as floods, landslides, earthquakes, volcanoes, coastal erosion, cyclones, and tsunamis, along with their causes and preventive measures.
5. Analyze the environmental impacts of human activities, focusing on water pollution, land contamination, marine pollution, groundwater quality, waste management, and mining pollution.
6. Understand the methods of environmental monitoring and assess the effects of climate change on geological and environmental systems.
7. Develop skills of presentations and narration using computer & multimedia.

SEMESTER-VI:
Paper MIN GEO-607: MINING AND ENVIRONMENTAL GEOLOGY
(Course code: MIN GEO-607) Credit: 3

DISCIPLINE SPECIFIC COURSES (MINOR)							
COURSE	*SEMESTER*	*COURSE CODE*	*COURSE TITLE*	*THEORY*			
				Credits	*Lectures*	*External*	*Internal*
Degree Course	*B.Sc. VI*	*MIN GEO-607*	**MINING AND ENVIRONMENTAL GEOLOGY**	**3**	**45**	***40 Marks***	***35 Marks***

UNIT	*TOPIC*	*No.Of Lectures* (45 hrs)
Unit 1	• Introduction to mining geology: objectives and significance. • Stages of mining: exploration, development, exploitation, and reclamation • Classification of mining methods: Open-cast and underground.	**15**
Unit 2	• Concepts and principles of environmental geology. • Natural environmental hazards: floods, landslides, earthquakes, volcanoes, Coastal erosion, cyclones and tsunamis - causes and preventive measures.	**15**
Unit 3	• Environmental implications; Water pollution, Contaminated Land, Marine Pollution, Groundwater Quality Management, Waste Management, Mining Pollution. • Environmental Monitoring and climate change.	**15**

Suggested readings

- Clark, G.B. 1967. Elements of Mining. 3rd Ed. John Wiley & Sons.
- Arogyaswami, R.P.N. 1996 Courses in Mining Geology. 4th Ed. Oxford-IBH.
- Moon, C.J., Whateley, M.K.G., Evans, A.M., 2006, Introduction to Mineral Exploration, Blackwell Publishing.
- Valdiya, K.S., 1987. Environmental Geology – Indian Context. Tata McGraw Hill.
- E.A. Keller (2010): Environmental Geology (9th Edition).

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

KSKV Kachchh University, Bhuj - Kachchh

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

SEMESTER VI:

Paper MIN GEO-608-P MINING AND ENVIRONMENTAL GEOLOGY

Practical/ Lab course (Course code: MIN GEO 608-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*
Degree Course	**B.SC-VI**	*MIN* **GEO-608-P**	**MINING AND ENVIRONMENTAL GEOLOGY**	**1**	**30 hrs**	*25 (10+15) Marks*

- Prepare flowcharts illustrating the four stages of mining: exploration, development, exploitation, and reclamation.
- Prepare diagrams of different mining methods (open-cast and underground mining).
- Study global and regional climate data (temperature rise, sea-level changes) and prepare charts illustrating climate trends.
- Case Studies on Natural Hazards

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 VI:

INTERNSHIP IN GEOLOGY (MAJOR SPECIFIC COURSE)

Internship (Course code: IN GEO 609)

Credit: 4

Title	Credit
Includes Dissertation/Project work/ Internship (other than self-institute)/Review work/other relevant	Total credit: 04

The credit weightage for Internship/Apprenticeship/OJT is suggested to be 30 hrs. per credit if they have only practical exposure or lab-based activities. Accordingly, the students must dedicate required number of hours for the same. The guidelines offer scope for providing hands on learning with classroom experience. In case of field visit or experiential learning, 1 credit is equivalent to 40-45 Hours.

Both HEIs & Industries can decide mutually for the duration of classroom lecture and industry visit.

Credit allocation:

		For earning 4 credits
Lab based activities or practical exposure	30hrs/ credit	120 hrs per paper
Field visit or experimental learning	40-45 hrs/credit	160-180 hrs per paper
Please refer 3.4.2 & 3.4.3 of SOP page no.		

Evaluation:

- **Marking system will be 60% and 40% for Supervisor and faculty respectively. 60% of the marking should be given by the external supervisor while 40% internal assessment will be based on viva and report submission.**
- **Report** of the training will be must for proper documentation.
- **Certificate** from SKP will be required on successful completion.

General Rules:

- The Internship or skill earning can be from any organization/industry/Govt. body/NGO/any other institute/ SKP (Skill Knowledge Provider) etc.
- For Industry or other institute internship please refer 3.4.3 of SoP.
- The concerned can issue a certificate or letter for work completion after successful completion of OJT/Internship/Apprenticeship activities by students.

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2025-26 UNDER NEP-2020)
SEMESTER VI:
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.