SOMAIYA VIDYAVIHAR

K J Somaiya College of Science & Commerce

Autonomous (Affiliated to University of Mumbai)

Somaiya TRUST

Learning Outcomes based Curriculum Framework

(LOCF)

For

F.Y. B.Sc. Geology

Undergraduate Programme

From

Academic year

2023-24

Vision & Mission

Mission:

- Equip the student with knowledge and skills of their chosen vocation,
- Inculcate values.
- Provide them opportunities for all round growth and prepare them for life.

Vision:

- To equip the students with advanced knowledge and skills in their chosen vocation.
- To provide value-based education and opportunities to students.
- To help them to face challenges in life.
- To nurture a scientific attitude, temperament and culture among the students.
- To continually review, develop and renew the approach to build India of the Founder's dream.

Goals and Objectives:

- To build a strong Academia-Industry bridge.
- To provide flexibility in the courses offered and proactively adapt to the changing needs of students and the society.
- To establish a centre for multidisciplinary activities.
- To mould individuals who would nurture the cultural heritage of our country and contribute to the betterment of the society.

Board of studies in Geology

	Name	Designation	Institute/Industry
Head of the Department			
1	Mr. Deepak Kumar Sahu	Chairman	K J Somaiya College of Science and Commerce
Subject Expert nominated by Vice-Chancellor			
1	Dr. Vikram Vishal	Professor	IIT, Bombay
Subject experts			
1	Dr. Bobby Mathew	Associate Professor	St. Xaviers College, Mumbai
2	Dr. Raymond Duraiswami	Associate Professor	Savitribai Phule Pune University
3	Dr. Pravin Henriques	Associate Professor	St. Xaviers College, Mumbai
4	Dr. Durga P Mohanty	Assistant Professor	Savitribai Phule Pune University
5	Dr. Pankaj Khanna	Assistant Professor	IIT, Gandhinagar
Representative from Industry/corporate sector/allied area			
1	Mr. Bipin Gedam	Reservoir Geologist	ONGC, Mumbai
Meritorious Alumnus			
1	Mr. Omkar Sagavekar	MSc-I	K J Somaiya College of Science and Commerce, Mumbai
Faculty of the specialisation			
1	Dr. Jyoti Sharma	Assistant Professor	K J Somaiya College of Science and Commerce
2	Mr. Robinprince Udhaya Edward	Assistant Professor	K J Somaiya College of Science and Commerce
3	Dr. Anirban Mitra	Assistant Professor	K J Somaiya College of Science and Commerce

4	Dr. Mayashri Rajkakati	Assistant Professor	K J Somaiya College of Science and Commerce
5	Dr. Vedanta Adak	Assistant Professor	K J Somaiya College of Science and Commerce

Foreword

Autonomy reflects efforts for excellence in academic performances, capability of self-governance and enhancement in the quality of education. In the year 2012, the UGC and University of Mumbai conferred the Autonomous Status to K J Somaiya College of Science and Commerce. Post this recognition and having several accolades to our credit, we made significant changes to our existing syllabi to reflect the changing business, industrial and social needs. A holistic education that provides opportunities to gain and share knowledge, experiment and develop beyond curriculum, is offered at our College.

Autonomous college carries a prestigious image for the students and the teachers and we have made a collaborative attempt to maintain a high level of quality in the standard of education that we impart.

Structured feedback obtained from the students, alumni and the experts from the industry and the changes suggested by them were duly incorporated in the syllabi. The Board of Studies constituted for each department meets to carry out in depth discussions about different aspects of the curriculum taking into cognizance the recent trends in the discipline.

The IQAC team has facilitated the conduct of a number of workshops and seminars to equip the faculty with the necessary skill set to frame the syllabi and competencies to deliver the same. Training was also provided to employ innovative evaluation methods pertaining to higher cognitive levels of revised Bloom's taxonomy. This
ensured the attainment of the learning outcomes enlisted in the syllabus. Audits are conducted to critically review the practices undertaken in teaching, learning and evaluation. Innovative learning methodologies such as project-based learning, experiential learning and flip- class learning practiced by a committed fleet of faculty, supported by several hands have been our unique outstanding propositions. All efforts have been made to nurture the

academic ambitions as well as the skills in co-curricular activities of the most important stakeholder i. e. student.

With sincere gratitude, I acknowledge the constant support and guidance extended by Shri Samir Somaiya, President- Somaiya Vidyavihar, and all the esteemed members of the Governing board and Academic council of the College. I also would like to acknowledge the Heads of the Departments and all the faculty members for their meticulous approach, commitment and significant contribution towards this endeavour for academic excellence.

Dr. Pradnya Prabhu

Principal

Acknowledgement

At the outset, I would like to thank our Principal Dr. Pradnya Prabhu for her guidance and support during the curriculum restructuring process. I am also grateful to all the esteemed members of the Board of Studies, for their constructive suggestions and contributions.

Above all, I am deeply indebted to all the young and vibrant colleagues in the Department of Geology for the long and arduous work they have put in during the compiling of the restructured syllabus.

Mr. Deepak Kumar Sahu

Chairperson

Board of Studies in Geology

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Preamble

Geology, the scientific study of the Earth's structure, processes, and materials, is a discipline of paramount importance that unravels the intricate story of our planet's evolution. From the towering peaks that shape our landscapes to the hidden reservoirs of invaluable resources beneath the surface, geology is the key to understanding the dynamic forces that have sculpted our world. It plays a critical role in addressing environmental challenges, predicting and mitigating natural disasters, and responsibly harnessing Earth's wealth of minerals and energy resources. Inextricably linked to our daily lives, geology serves as a compass guiding humanity towards sustainable practices, as we strive to coexist harmoniously with the ever-changing forces that govern our planet. Embracing the study of geology is an acknowledgment of our interconnectedness with the Earth and a commitment to navigating the complexities of our shared future.

Education is one of the most critical yardsticks in any country’s development. The new National Education Policy (NEP) 2020 is an essential and comprehensive policy framework that aims to revamp the country’s educational system from its foundation and to bring it at par with global standards. The larger aim of this policy is to transform the Indian education system by making it more inclusive, flexible and relevant to the changing needs of the society. Some of the key features of this policy are the introduction of vocational training, elective courses, emphasis on cultural studies, development of global skill sets and the promotion of multilingualism.

The policy seeks to bring about significant changes in the Higher Education structure, such as introducing a four-year undergraduate degree Programme, establishing multidisciplinary education and research universities, pooled credit bank and creating a National research Foundation to promote and support research activities in various fields. The new education policy enables every student to get quality education irrespective of their socio-economic

background, gender or disability. NEP 2020 enables teachers to use a variety of learning techniques and experiments.

In the current fast paced world, simply cascading the knowledge in the classroom is not sufficient especially when the global requirements keep changing. Every learner should be encouraged to exchange ideas and thoughts in a collaborative approach. This leads to develop an environment which is cognitive in nature and not a one-way information flow. Keeping all this in mind, the curriculum under Learning Outcome-based Curriculum Framework (LOCF) is designed.

This Learning Outcome-based Curriculum Framework (LOCF) supports the fundamental principle of providing quality education in India. Our focus is to involve young minds to participate, contribute and add value at each stage in the field of their study. The introduction of Choice Based Credit System (CBCS) has maximized the benefits of the newly designed curriculum in multiple folds.

The LOCF will certainly help teachers to envisage the outcome expected from the learners at the end of the programme. For students, it will be a guide which shows how this curriculum will help them acquire all the skills and knowledge which are essential in their personal and academic growth. Higher education qualifications such as Bachelor's Degree Programme are awarded on the basis of demonstrated achievement of outcomes and academic standards; and this is the very essence of this curriculum.

1. Introduction

The B.Sc. Geology programme is developed by keeping in mind interest of learners to explore the field of Geology. The framework helps to maintain the standard of Geology degrees/programmes through periodic programme review within a broad framework of agreed/expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The BSc programme is planned in such a way that it allows flexibility and innovation in programme design, syllabi development, teaching-learning process and quality assessment of students learning levels.

This curriculum framework is developed on the principles of student centric learning pedagogy. The platform intents to empower graduates with the skills required for pursuing Geology-related careers, higher education in Geology and allied subjects.

Various graduate attributes are emphasised in this framework such as critical thinking, basic psychology, scientific reasoning, moral ethical reasoning, etc. While designing this framework, an important aspect considered was the measurable teaching-learning outcome to ensure employability of the graduates. Implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms are suggested through this framework. The framework also focuses on issues relevant to India and also of the rest of the world;

Every course is designed in such a way that students get decent exposure to each topic by keeping an equilibrium between these topics and thus creating interest to pursue further education in the field of Geology. It encompasses fundamental principles in Geology, laying a robust groundwork for students and enabling them to delve deeper into the subject. The curriculum covers a wide array of topics, including petrology, mineralogy, structural geology, geochemistry, palaeontology, geohydrology, coal and petroleum geology, volcanology, remote sensing, GIS, and its applications, as well as economic geology. Additionally, semester III and IV include specialized courses on geohazards (such as earthquakes and flooding) and their mitigation, cartography, field geology, terrain mapping, and watershed management. Semester V introduces elements of geochemistry, remote sensing, GIS, exploration geology,

statistics in geology, and oceanography. Semester VI delves into vital subjects such as Earth and Climate, environmental geology, the evolution of life through time, mathematics in geosciences, and geophysical exploration, addressing the increasing relevance of these topics in the contemporary context.

The practical sessions will help the students to gain sufficient skills in chemical analysis, preparations, solvent extraction, chromatography, as well as quantitative analysis. Students are also encouraged to improve their scientific writing skills through various assignments. The research-based project work in the curriculum ensures team building attitude within students and utilise every aspect of the team members in the success of any project. The project evaluation method is designed in such a way that it helps in creating a strong background for the research, skills to generate systematic reports and create effective presentation.

2. Learning Outcome based Curriculum Framework

LOCF focuses on curriculum framework, curriculum aims, learning targets and objectives. The curriculum framework also provides examples of effective learning, teaching and assessment practices. As the curriculum development is a collaborative and an on-going enhancement process, the LOCF instructs periodic reviews and revisions of the curriculum in accordance with the ever changing needs of students, teachers and society.

The framework describes how students are given exposure towards core knowledge of the subject, specialisation, choice based learning and other skill enhancement courses ensuring development of an integrated personality and employability. The template defines expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and ethical awareness, and leadership readiness along with specific learning course outcomes at the starting of each course. The Learning Outcomes based Curriculum Framework (LOCF) for B.Sc. with Geology will certainly be a valuable document in the arena of outcome-based curriculum design.

2.1 Nature and extent of B.Sc. Geology

Degree programme in Geology is designed to include cutting edge and core topics from Core and Applied branches of Geology in a perfect balance. The scope of individual topics varies with the nature of specific branch of geology that is being taught. In our endeavour to improve the employability of graduates of geology programme, the curriculum offers courses that provide skills which are highly sought after in the industry like remote sensing & GIS, hydrology, field geology and terrain mapping, watershed management, economic geology, exploration geology, among others. The B.Sc. geology programme is of three years duration. Each year is divided into two semesters. The total numbers of semester are six. The teaching and learning in the B.Sc. geology programme will involve theory classes (lectures) and practical.

The curriculum will be taught through formal lectures with the aid of power-point presentations, audio and video tools and other teaching aids can be used as and when

required. Wherever possible RBPT approach will be adopted to make the process of learning more learner-centric. ICT-based teaching-learning tools will be incorporated through which even the mundane aspects could be made more interesting and relevant.

2.2 Programme Education Objectives (PEOs)

The overall aims of bachelor's degree programme in geology are to:

1. Create a great learning environment for students to inculcate deep interests in geology.
2. Provide choice-based learning to students.
3. Empower students by providing appropriate tools of analysis to address issues and problems in the field of geology
4. Help students to develop the ability to use their knowledge and skills to handle the specific theoretical and applied problems in geology
5. Encourage students to pursue advanced studies related to geology by creating a strong and profound base of fundamental concepts.
6. Assist students to develop an array of industry-ready skills which are helpful in creating employment and business opportunities.

3. Graduate Attributes in Geology

Attributes expected from the graduates of B.Sc. Geology Programme are:

GA 1: Comprehensive knowledge and understanding of various concepts and theoretical principles in the field of geology and its different sub-fields.

GA 2: Excel in critically evaluating geological problems, devising innovative solutions, and making informed decisions based on geological evidence.

GA 3: Solid understanding of geotechnical instruments, laboratory techniques, and software tools commonly used in geological research and exploration.

GA 4: Possess a holistic understanding of the interconnectedness of geology with other scientific disciplines, fostering a multidisciplinary approach to problem-solving.

GA 5: Proficient in conducting field studies, collecting geological samples, and interpreting geological features in various natural environments.

GA 6: Conscious of the environmental impact of geological activities, and they strive to integrate sustainable practices into their work.

GA 7: Work effectively in multidisciplinary teams, collaborating with professionals from various backgrounds to address complex geological challenges.

GA 8: Skilled in collecting, managing, and analysing geological data using statistical methods and modelling techniques to extract meaningful patterns and trends.

GA 9: Adhere to ethical standards in geological research, exploration, and resource management and understand the importance of responsible conduct in their professional endeavours.

GA 10: Applying the scientific method to investigate geological phenomena, conduct field studies, and analyse data to draw meaningful conclusions.

4. Qualification descriptors

Upon successful completion of the programme, students receive B.Sc. degree in the Geology. B.Sc. Geology graduates of this department are expected to demonstrate the extensive knowledge of various concepts of geology and its application, thus contributing in research, development, teaching, government and public sectors. This programme will establish a solid foundation for the student to pursue higher studies in Geology such as Post Graduation or further research in the subject. Undergraduate degree programmes of either 3 or 4-year duration, with multiple entry and exit points and re-entry options, with appropriate certifications such as:

● A UG certificate is awarded to students who opt to exit after completing 1 year (2 semesters) of study in the chosen fields of study with having secured 44 credits and in addition, they complete one vocational course of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

● A UG diploma is awarded to students who opt to exit after 2 years (4 semesters) of study with having secured 88 credits and in addition, they complete one vocational course of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.

● A bachelor's degree is awarded after a 3-year (6 semesters) programme of study in major discipline with having secured 132 credits and minimum credit requirements as follows.

Sr No	Category of Courses	Minimum credit requirements
1	Major Core Course	48
2	Minor Stream Course	20
3	Discipline Specific Elective Course	06

4	Ability Enhancement Course	08
5	Skill enhancement Course	06
6	Value Education Course	04
7	Vocational Skill Course	08
8	Indian Knowledge System	02
9	Co-curricular Course	20
10	Open Elective Course	10
Total		132

● A 4-year bachelor's degree (honours) is awarded after eight semesters programme of study with having secured 176 credits and minimum credit requirements as follows:

● If the student completes a rigorous research project in their major area(s) of study in the 4th year of a bachelor's degree (honours with research).

● Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a faculty member of the University/College. The research project/dissertation will be in the major discipline. The students who secure 176 credits, including 12 credits from a research project/dissertation, are awarded UG Degree (Honours with Research).

Sr no	Category of Courses	Minimum credit requirements
1	Minor core course	76
2	Minor stream course	24
3	Discipline specific elective course	14
4	Ability enhancement course	08
5	Skill enhancement course	06

6	Value Education Course	04
7	Vocational Skill Course	08
8	Indian Knowledge System	02
9	Co-curricular Course	24
10	Open Elective Course	10
Total		176

The 4-year bachelor's degree programme is considered a preferred option since it would provide the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of the student.

Upon successful completion of the programme, students receive B.Sc. degree in Geology. B.Sc. Geology graduates of this department are expected to demonstrate the extensive knowledge of various concepts of Geology and its application thus contributing in research, development, teaching, government and public sectors. This programme will establish a foundation for students to further pursue higher studies in Geology. The list below provides a synoptic overview of possible employment areas provided by an undergraduate training in Geology.

The list below provides a synoptic overview of possible career paths provided by an undergraduate training in Geology:

1. Academics
2. Research
3. Mining industry
4. Mineral Exploration companies
5. GIS-based companies
6. Remote sensing industry
7. Hydrogeology
8. Geohazard mitigation industry
9. Oil and Gas sector

10. Coal sector
11. Energy sector
12. Civil construction companies
13. Environmental monitoring and analysis
14. Climate change related industry

Job Roles for B.Sc. Geology graduate:

After graduation one can seek a professional career as:

1. Field Geologist
2. Laboratory Geologist
3. Geochemist
4. Geophysical surveyor
5. GIS analyst
6. Remote sensing analyst
7. Data analyst (Geological data)
8. Academician.
9. Environment analyst
10. Project fellow
11. Entrepreneur
12. Civil services
13. Competitive exams

Higher Education options for B.Sc. Geology graduate:

1. M.Sc. / M.Sc. Tech/ M.Tech. in Geology/ Applied Geology/ Geophysics/ Petroleum Geology/Mineral Exploration/Geo-Informatics
2. Integrated M.Sc.-Ph.D. in Geology
3. PG Diploma in advanced remote sensing and GIS,
4. Courses in management

5. B.Ed.

The learners who complete three years of full-time study of an undergraduate programme of study will be awarded a Bachelor's degree in Geology.

5. Programme Specific Outcomes (PSOs)

After the successful completion of modules in different courses of B.Sc. Geology, the learner will be able to:

PSO I: Discuss the fundamental concepts in core (e.g., mineralogy, petrography, structural geology, palaeontology, geochemistry, etc.) and applied (economic geology, mineral exploration, geohazard mitigation, remote sensing and GIS, etc.) branches of Geology.

PSO II: Relate Cutting-edge Knowledge acquired in different fields of geology such as mineral physics, isotope and trace element geochemistry, thermodynamics, field geology, ore-forming processes, geohazard mitigation etc. to develop state of the art technologies to safeguard or for improving human life.

PSO III: Use analytical skills, problem solving skills requiring applications of geological principles.

PSO IV: Identify, differentiate and characterize various geological materials using laboratory and instrumentation techniques.

PSO V: Apply good laboratory practices and safety principles and create awareness about environmental issues.

PSO VI: Justify the central role of geology in society and have preparedness in lifelong learning of technological change.

5.1Course Mapping

Semester	PSO / Course	I	II	III	IV	V	VI
I	MJ I	√		√	√	√	
	MJ II	√	√	√	√	√	√
	MN I	√		√		√	√
	MN II	√	√	√	√	√	√
	AEC I						
	AEC II						
	VEC						
	CC						
	OE						
II	MJ I	√	√	√			√
	MJ II	√	√	√	√	√	√
	MN I	√	√	√			√
	MN II	√	√	√	√	√	√
	AEC I						
	AEC II						
	VEC						
	IK						
	CC						
	OE						

6. Structure of B.Sc. Geology programme

The curriculum frame work is designed around the choice-based credit system (CBCS). The programme consists of three years UG having six semesters (two semesters per year) or four years UG (Honours) having eight semesters (two semesters per year). To acquire a degree in B.Sc. geology a learner must study

1. **Major Core Courses (MJ):**

a) A course which is required to be opted by a candidate as a major core course. The course designed under this category aims to cover the basics that a student is expected to imbibe in that particular subject or discipline.

b) Students may be allowed to change major within the broad discipline at the end of the second semester by giving her/him sufficient time to explore interdisciplinary courses during the first year.

c) There are twenty four Major Core courses (MJ), two each, in semesters I to IV; and four each in semesters V and VIII.

d) Each Major Core Courses is compulsory.

e) Each Major Core Course from semester I to VI is comprised of 2 credits for theory i.e. 30 hours; 2 lectures of each 1 hr per week and 1 credit for practical of two hours per week in every semester.

f) Each Major Core Course from semester VII and VIII is comprised of 2 credits for theory i.e. 30 hours; 2 lectures of each 1 hr per week and 1.5 credit for practical of three hours per week in every semester.

g) The purpose of fixing major core papers is to ensure that the institution follows a minimum common curriculum so as to adhere to common minimum standards with other universities/institutions.

2. **Minor Stream Course (MN):**

a) A course is chosen by a candidate from interdisciplinary stream as a minor course. Minor stream course helps a student to gain a broader understanding beyond the major discipline.

b) Students who take a sufficient number of courses in interdisciplinary area of study other than the chosen major will qualify for a minor in that discipline.
c) Students who take a sufficient number of courses in interdisciplinary area of study other than the chosen major will qualify for a minor in that discipline.
d) Students who take a sufficient number of courses in interdisciplinary area of study other than the chosen major will qualify for a minor in that discipline.
e) Students who take a sufficient number of courses in interdisciplinary area of study other than the chosen major will qualify for a minor in that discipline.
f) Each Minor stream Courses is compulsory.

3. Ability Enhancement Courses (AEC)

a) The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic writing skills, that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity.
b) Students are required to achieve competency in a Modern Indian Language (MIL) and in the English language with special emphasis on language and communication skills.
c) There are five AE courses in spread over three semesters (I to III).
d) Each student is supposed to take two AE in semester I - English language and Modern Indian language of 2 credits each.
e) There are two AE in semester 2 - English language of two credits and Modern Indian language of 1 credit.
f) There is one AE in semester 3 - Modern Indian language of 1 credit.

4. Value Education Courses (VEC)

a) The course seeks to equip students with the ability to apply the acquired knowledge, skills, attitudes and values required to take appropriate actions for mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wildlife conservation, and sustainable development and living.

b) The VA courses offered are:

VA 1- Environmental Science I (2 credits) (Semester 1),

VA 1I- Environmental Science II (2 credits) (Semester 1I).

5. Co-Curricular courses (CC):

a) They are designed to provide skill-based knowledge and contain both lab/hands on training/field work.

b) The main purpose of these courses is to provide life skills in hands-on mode to increase employability.

c) There are two CC each in semester I to III – NCC (compulsory 1 credit course) and Other one from Music/Sports training program/Yoga/ Study Circle

d) There are three CC each in semester IV – NCC (compulsory 1 credit course), second one from Music/Sports training program/Yoga/ Study Circle of 1 credit and third one is Field project of 2 credits.

e) There are two CC semester V – Internship/ Apprenticeship (8 credit) and Field project (2 credit)

6. Open Elective (OE)

a) They are designed to provide multidisciplinary education.

b) Students can opt for one interdisciplinary Open Elective Course (OE) in each of the semester I and II of two credit each.

c) Students can opt for one interdisciplinary Open Elective Course (OE) in each of the semester III and IV of three credit each.

d) Open courses are offered in cognate disciplines by different departments in the college.

7. Indian Knowledge System (IKS)

a) They are designed to recognizes the rich heritage of ancient and eternal Indian knowledge and thought as a guiding principle.

b) Students can opt for one General IKS in semester 1 – Indian cultural Heritage of one credit.

c) There is one IKS based on major subject in semester III of 1 credit.

8. Skill Enhancement Course (SEC):

a) They are designed to provide skill-based knowledge pertaining to the Major course to the learner.

b) The main purpose of these courses is to provide life skills in hands on mode to increase employability.

c) There are two skill enhancement courses offered. Each student is supposed to take one SEC in each semester III and IV of 3 credit each (2 credit theory and 1 credit practical).

9. Discipline Specific Elective Courses (DSE):

a) Elective courses offered under the major course subject of study.

b) There are two discipline specific elective courses (DSE), offered in semesters VI of 2 credits theory and 1 credit practical.

c) There is one discipline specific elective course (DSE), offered in semesters VII and VIII each of 2 credits theory and 2 credit practical.

d) There is one advance level disciplinary course – Research Methodology of 4 credits offered in semester VII.

10. **Vocational Skill Course (VSC)**

a) Vocational courses are designed to provide practical, hands-on training, competencies, and proficiency to students, ultimately enhancing their skills and employability.

b) These courses are tailored to prepare individuals for specific careers and industries.

c) There are two VSC offered one each in semester III to IV, each one is of two credts.

d) There is one VSC offered in semester VI of 4 credits.

11. On Job Training (OJT)

a) On Job training of 4 credits is offered in semester VIII to enhance the specific skills and competencies required for a particular job

b) OJT bridges the gap between theory and practical application, promoting a deeper understanding of concepts.

6.1Content

Sr. No	Semester	Course number	Course Code	Course title
1	I	MJ I	23US1GEMJ1ESS	Earth System Science
2		MJ II	23US1GEMJ2GMP	Geomorphology
3		MJ P1	23US1GEMJ1P	Based on MJ I
4		MJ P2	23US1GEMJ2P	Based on MJ II
5		MN I		Course from Physics/ Mathematics/ Chemistry
6		MN II		Course from Physics/ Mathematics/ Chemistry
7		MN P		Based on MN I and MN II
8		AEC I		Communication in English Level 1
9		AE II		Modern Indian Language Level 1 (Hindi/Marathi)
10		VA		Environmental Science I
11		CC I		NCC

12		CC II		Music/Yoga/Sports Training Program Level 1/ Study Circle
13		OE		Social Media Advertising/ Introduction to microeconomics
14	II	MJ I	23US2GEMJ1SPT	Structural Geology and Plate Tectonics
15		MJ II	23US2GEMJ2EGE	Economic Geology
16		MJ P1	23US2GEMJ1P	Based on MJ I
17		MJ P2	23US2GEMJ2P	Based on MJ II
18		MN I		Course from Physics/ Mathematics/ Chemistry
19		MN II		Course from Physics/ Mathematics/ Chemistry
20		AEC I		Communication in English Level II
21		AEC II		Modern Indian Language Level II (Hindi/Marathi)
22		VEC		Environmental Science - II

23		IK		Indian Cultural Heritage
24		CC I		NCC
25		CC II		Music/Yoga/Sports Training Program Level 1/ Study Circle
26		OE		Indian Finance system and budget/ Brand Management

6.2 Credit distribution for B.Sc. Geology

Semester	Course number	Course title	Credits		
			Theory	Practical	Total
I	MJ I	Earth System Science	2	1	3
	MJ II	Geomorphology	2	1	3
	MN I	Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry	2	1	3
	MN II	Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry	1	1	3

	AEC I	Communication in English Level 1	2		2
	AEC I	Modern Indian Language Level 1	2		2
	VEC	Environmental Science I	2		2
	CC I		1		1
	CC II		1		1
	OE		2		2
	Total				**22**
II	MJ I	Structural Geology and Plate Tectonics	2	1	3
	MJ II	Economic Geology	2	1	3
	MN I	Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry	2	1	3
	MN II	Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry	2	1	3
	AEC I	Communication in English Level II	2		2

	AEC II	Modern Indian Language Level II	1		1
	VEC	Environmental Science - II	2		2
	IKS	Indian Cultural Heritage	1		1
	CC I		1		1
	CC II		1		1
	OE		2		2
	Total				**22**

6.3 Semester Schedule

Semester	Major Core Courses (MJ)	Minor Stream Courses (MN)	Ability Enhancement Courses (AEC)	Value Education Course (VEC)	Indian Knowledge System (IKS)	Co-Curricular Course (CC)	Open Elective (OE)
I	1]MJI Earth System Science 2] MJ II Geomorphology	1] MN I Course from Biochemistry/ Physics/ Mathematics/ Physics/	1] AEC I Communication in English Level I 2] AEC II Modern	Environment Science I	-	1] NCC II] Music/ Yoga/ Sports Training Program Level 1/ Study Circle	Social Media Advertising/ Introduction to microeconomics

		Microbiology/ Botany/ Zoology/Chemistry 2] MN II Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/Chemistry	Indian Language Level I				
II	1] Structural Geology and Plate Tectonics 2] MJ II Economic Geology	1] MN I Course from Biochemistry/ Physics/ Mathematics/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry 2] MN II Course from Biochemistry/ Physics/ Mathemati	1] AEC I Communication in English Level II 2] AEC II Modern Indian Language Level II	Environment Science II	Indian Cultural Heritage	1] NCC II] Music/ Yoga/ Sports Training Program Level 1/ Study Circle	Indian Finance system and budget/ Brand Management

		cs/ Physics/ Microbiology/ Botany/ Zoology/ Chemistry					

6.4Course Learning Objectives

The meticulously designed three-year undergraduate Geology program is tailored to immerse students in the forefront of geological advancements. The structured syllabus is meticulously crafted to elucidate intricate geological concepts and fundamentals, fostering a profound understanding and a genuine passion for the subject. The overarching objective is to facilitate vertical growth in students' proficiency, ensuring the development of advanced skills in geological analysis and critical thinking. Our pedagogical approach is grounded in the belief that students can attain these objectives through a synergistic blend of in-depth literature review and dynamic class lectures. This is further complemented by targeted feedback on their written assignments, project/research papers, presentations, discussions, and debates. Our commitment lies in providing a learning environment that empowers students to cultivate compelling arguments, underpinned by robust evidence, all deeply rooted in an immersive training in specialized geological techniques and methodologies. Essentially, our intention transcends traditional teaching methods, aiming to create an atmosphere where students not only master the intricacies of Geology but also emerge as proficient analytical thinkers adept in employing advanced geological methodologies to substantiate their arguments.

7. Detailed B.Sc. Geology Syllabus

F. Y. B.Sc. Syllabus with effect from the Academic year 2023–2024

Syllabus - F. Y. B.Sc. Geology

Course No.	Course Title	Course Code	Credits	Periods (1 Hr)	Module	Lectures/ module (1 hr)	Examination		
							Internal Marks	External Marks	Total Marks
SEMESTER I									
Major Core courses THEORY									
I	Earth System Science	23US1GEMJ1ESS	2	30	2	15	20	30	50
II	Geomorphology	23US1GEMJ2GMP	2	30	2	15	20	30	50
Core courses PRACTICAL									
	Based on MJ I	23US1GEMJ1P	1	30			CIA		25
	Based on MJ II	23US1GEMJ2P	1	30			CIA		25
SEMESTER II									
Major Core courses THEORY									
I	Structural Geology and Plate Tectonics	23US2GEMJ1SPT	2	30	2	15	20	30	50
II	Economic Geology	23US2GEMJ2EGE	2	30	2	15	20	30	50
Core courses PRACTICAL									
	Based on MJ I	23US2GEMJ1P	1	30			CIA		25
	Based on MJ II	23US2GEMJ2P	1	30			CIA		25

F.Y. B. Sc. (Geology) SEMESTER I

Major Core Course- I

COURSE TITLE: Earth System Science

COURSE CODE: 23US1GEMJ1ESS [CREDITS - 02]

Course Learning Outcomes
After the successful completion of the Course, the learner will be able to: 1. Identify the basic processes involved within the Earth 2. List various methods for calculation of the age of the Earth 3. Understand the basics of plate tectonics and mantle convection 4. Comprehend interactivity between the hydrosphere, atmosphere, biosphere and lithosphere 5. Understand Ocean and atmospheric circulation 6. Explain the process of soil formation and soil types

Module 1	Solid Earth	[15L]

Learning Objectives:

1. State perspectives of geology.
2. Infer Earth's internal structure and formation of solar system.
3. Analyse the age of the Earth.

Learning Outcomes:

Learning Outcome:

1. Define geology and its branches
2. Paraphrase the origin of earth
3. Illustrate the interior of Earth
4. Explain the plate tectonics model

5. Comprehend the concept of radioactivity.		
1.1	Geology and its perspectives. Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites; Internal structure: core, mantle, and crust. Continental and Oceanic Crust.	[2L]
1.2	Introduction to Plate Tectonics and Mantle Convection in the Earth's core and production of its magnetic field Radioactivity	[5L]
Module 2	**Interaction between the three spheres**	**[15L]**
Learning Objectives: 1. Describe elements of Hydrosphere and Atmosphere circulation of Earth 2. Explain the ocean circulation 3. Emphasize on the interrelation of atmospheric and oceanic circulation		
Learning Outcomes: 1. Illustrate the Hydrological cycle 2. Identify the ocean relief features 3. Relate the elements of Oceanic and Atmospheric Circulation		
2.1	Interaction between Atmosphere, Hydrosphere, Biosphere. General relief features of Ocean floor, Ocean Currents.	
2.1	Climate and Weather associated hazards Structure of Atmospheric circulation, Ocean currents. Soil and Soil Profile.	
References 1. Skinner, B. J., Porter, S. C., & Botkin, D. B. (1994). Blue Planet: An Introduction		

to Earth System Science. Laboratory Manual. John Wiley & Sons.

2. Siddhartha, K. (2016). Oceanography A Brief Introduction. Kisalaya Publications Pvt. Limited.

3. Selby M.J. (1985), Earth's Changing Surface - An Introduction to Geomorphology, Oxford University Press

4. Grotzinger, J., & Jordan, T. H. (2010). Understanding earth. Macmillan.

5. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology.Taylor & Francis.

Question paper Template

F.Y. B. Sc. (Geology) SEMESTER I

Major Core Course- I

COURSE TITLE: Earth System Science

COURSE CODE: 23US1GEMJ1ESS [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	5	5	5	5	-	25
II	5	15	5	-	-	-	25
Total marks per objective	10	20	10	5	5	-	50
% Weightage	20	40	20	10	10	-	100

F.Y. B. Sc. (Geology) SEMESTER I

Major Core Course- II

COURSE TITLE: Geomorphology

COURSE CODE: 23US1GEMJ2GMP [CREDITS - 02]

Course Learning Outcomes
After the successful completion of the Course, the learner will be able to: 1. Analyse geomorphological systems in terms of resisting and driving forces 2. Evaluate the creation of landforms by different surface processes 3. Describe the exogenous and endogenous processes in the landscape, their importance in landform development, and distinguish the mechanisms that control these processes 4. Analyse how variations in climate, tectonics and environment affect the development of landforms 5. Assess how different scales of time and space affect geomorphological Processes

Module 1	Geomorphic System	[15L]

Learning Objectives:

The module is intended to

1. Distinguish between the endogenic and exogenic sources of energy
2. Evaluate the evolution of the geomorphic theory over time
3. Identify landforms created by various weathering processes
4. Identify the geomorphic landforms created by aeolian processes and
5. Evaluate the role of various aeolian parameters in their formation
6. Assess the role of anthropogenic activities on a landscape

Learning Outcomes:

After the successful completion of the module, the learner will be able to:

1. Identify the interactions that result in formation of different landscapes and predict the outcome given a set of geomorphic conditions 2. Judge the applicability of an isotopic dating method in a given situation to solve a geomorphic problem 3. Distinguish between the different types of deserts based on their causative mechanisms and generate a list of common factors that lead to formation of deserts		
1.1	Interaction of rock cycle and water cycle. Denudation and Deposition: Weathering, Erosion and Mass wasting, Factors controlling Weathering, Types of Weathering, Sediment transportation, Sediment deposition. Classification of Mass movement.	
1.2	Aeolian Processes and Landforms: Aeolian erosion, transport and deposition. Deserts, dunes, loess	
Module 2	**Geomorphic Process**	**[15L]**

Learning Objectives:

This module is intended to:

1. Identify the geomorphic landforms created by fluvial processes.
2. Estimate the scale of a flood and determine its severity based on a time dependent change in the hydrographs
3. Differentiate between consequent and transverse drainage patterns.
4. Identify geomorphic landforms created by glacial processes and evaluate the role of various glacial parameters in their formation
5. Identify the geomorphic landforms created by coastal processes
6. Assemble a list of factors that affect the formation of karst landforms.

Learning Outcomes:

After the successful completion of the module, the learner will be able to:

1. Evaluate the role of various fluvial parameters in their formation
2. Evaluate the tectonic changes in the landscape
3. Classify and distinguish between the different types of glaciers, their formation and the mechanisms of their movement
4. Evaluate the effect of epeirogeny in a region and determine its effect on isostatic rebalance of the tectonic plate
5. Analyse the formation of waves and determine the areas of high-energy and low-energy wave action that may lead to coastal erosion or coastal deposition respectively
6. Evaluate the role of relative tectonic uplift or subsidence in generating coastal landforms

2.1	Fluvial Processes and Landforms: W.M. Davis Cycle of erosion, Fluvial Transport and Deposition: Alluvial Fans, Floodplains and Terraces, Alluvial Bars, Braided Channels, Straight and Meandering Channels.
2.2	Glaciers and Glaciated landforms: Ice movement, flow patterns, forms of glacier surfaces, glaciated erosional landforms and glaciated depositional landforms.

References:

1. Shuttleworth, E., Huggett, R. J. (2023). Fundamentals of Geomorphology. United Kingdom: Routledge.
2. Huggett, R. (2016). Fundamentals of Geomorphology. United Kingdom: Taylor & Francis.
3. Selby M.J. (1985), Earth's Changing Surface - An Introduction to Geomorphology, Oxford University Press

4. Gupta, A., Kale, V. S. (2001). Introduction to Geomorphology. India: Orient Longman.

5. Summerfield, M. A. (2014). Global Geomorphology. United Kingdom: Taylor & Francis.

6. Bloom, A. L. (2004). Geomorphology: A Systematic Analysis of Late Cenozoic Landforms. United States: Waveland Press.

Question Paper Template

F.Y. B. Sc. (Geology) SEMESTER I

Major Core Course- II

COURSE TITLE: Geomorphology

COURSE CODE: 23US1GEMJ2GMP [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	5	5	5	5	-	25
II	5	15	5	-	-	-	25
Total marks per objective	10	20	10	5	5	-	50
% Weightage	20	40	20	10	10	-	100

F. Y. B. Sc. (Geology)

SEMESTER I - Practical

Course Title: Earth System Science Practical

COURSE CODE: 23US1GEMJ1P Credit- 01

Learning Objectives: Familiarise with Interior Structure of the earth, Ocean morphology, atmospheric Circulation and soil profiles in the earth with age.
Learning Outcomes: 1. Learn about the various Ocean floor morphological features 2. Learn about the Interior of the earth and its layered structure. 3. Understand the Ocean and Atmospheric Circulation and its relationships. 4. Understand Soil Profiles and its variations in the earth's crust.
List of Practical
1. Ocean Floor Morphology 2. Preparation of diagram showing layered structure of Earth's interior 3. Problems related to absolute and relative dating methods 4. Study of Soil Profile 5. Exercise related to Ocean current and Circulation 6. Exercise related to Atmospheric Circulation

F.Y. B. Sc. (Geology)

Semester 1 - Practical

COURSE TITLE: Geomorphology Practical

COURSE CODE: 23US1GEMJ2P [CREDITS - 01]

Learning Objectives
Familiarise with the geomorphic landforms formed by different endogenic and exogenic processes and compute the rate of processes bringing about the change.
Learning Outcomes
1. Identify the individual landforms and the overall landscape on a toposheet or map and determine their causative mechanisms and processes. 2. Compute the change in exogenic processes with respect to time and their effect on the geomorphic landscape.
List of Practical
1. Toposheet Reading 2. Measurement of areas enclosed within curves 3. Topographic Profiles, Projected Profiles 4. Superimposed Profiles and Spur Profiles 5. Longitudinal and cross valley profiles 6. Drainage Basin Analysis – Linear aspects, Hypsometric analysis, watershed delineation, Types of Drainage 7. Identification of geomorphic features on different types of maps and toposheets.

F.Y. B. Sc. (Geology) SEMESTER II

Major Core Course- I

COURSE TITLE: Structural Geology and Plate Tectonics

COURSE CODE: 23US2GEMJ1SPT [CREDITS - 02]

Course Learning Outcomes		
After the successful completion of the Course, the learner will be able to: 1. Comprehend, assess, analyse different structures and develop core competencies to apply this knowledge in field and practical problems 2. Enhance their skills in structural mapping 3. Identify the basic processes involved within the Earth 4. Do Topographic Analysis and solve Structural Maps		
Module 1	**Topography and Geological Structures**	**[15L]**
Learning Objectives: 1. Recognize the basics of geologic structure and its types 2. Explain the different types of geological structures that are observed in rocks and methods of their classification		
Learning Outcomes: After the successful completion of the module, the learner will be able to: 1. Define structural geology and understand its significance 2. Distinguish between different types of folds, faults and dipping strata and measure the strike and dip of structural entities 3. Analyse the topographic, structural features and understand structural Maps.		
1.1	Effects of topography on structural features, topographic and structural maps, important representative factors of a topographic	

	map. Planar and linear structures: Concept of dip and strike, outcrop pattern of different structures.	
1.2	Geological structures: Geometric description and classification of folds, terminology and anatomy of faults, geometry and kinematics of faults.	
Module 2	**Plate Tectonics**	**[15L]**
Learning Objectives: 1. Familiarize the concept of Plate tectonics 2. Recognize and assemble the continents of the supercontinent, Pangea. 3. Describe the interaction between plate boundaries 4. Describe Volcanism and plate motion.		
Learning Outcomes: 1. Demonstrate a knowledge and understanding of the theory of tectonic plates with evidence 2. Demonstrate a knowledge and understanding of the three main types of plate boundary 3. Explain the process of the motion of the tectonic plates		
2.1	Concept of plate tectonics, sea-floor spreading, and continental drift.	
2.2	Geodynamic element of the earth - Mid-oceanic ridges, trenches, transform faults, island arcs	
2.3	Earthquakes and volcanoes associated with plate tectonics.	
References: 1. Condi, K. C. (2013). Plate Tectonics & Crustal Evolution. United Kingdom: Elsevier Science.		

2. Kluth, C. F., Reynolds, S. J., Davis, G. H., Kluth, C. (2012). Structural Geology of Rocks and Regions. United Kingdom: Wiley.

3. Park, R. G. (2004). Foundations of Structural Geology. United Kingdom: Routledge.

4. Ragan, D. M. (2009). Structural Geology: An Introduction to Geometrical Techniques. (n.p.): Cambridge University Press.

5. Billings, M. P. (1954). Structural Geology. United Kingdom: Prentice-Hall.

6. Fossen, H. (2016). Structural Geology. United Kingdom: Cambridge University Press.

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F.Y. B. Sc. (Geology) SEMESTER II

Major Core Course- I

COURSE TITLE: Structural Geology and Plate Tectonics

COURSE CODE: 23US2GEMJ1SPT [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	5	5	5	5	-	25
II	5	15	5	-	-	-	25
Total marks per objective	10	20	10	5	5	-	50
% Weightage	20	40	20	10	10	-	100

F.Y. B. Sc. (Geology) SEMESTER II

Major Core Course- II

COURSE TITLE: Economic Geology

COURSE CODE: 23US2GEMJ2EGE [CREDITS - 02]

Course Learning Outcomes		
After the successful completion of the Course, the learner will be able to: 1. Discuss the basic terminology used in economic geology 2. Explain the various endogenous processes of formation of ore minerals 3. Describe the exogenous processes of formation of ore minerals 4. Enumerate the different geographical and geological distribution of various economic minerals in India and the important metallogenic epochs		
Module 1	**Introduction and Endogenous processes of formation of Ore Minerals**	**[15L]**
Learning Objectives: 1. Become acquainted with the basic terminology used in economic geology 2. Explain the various endogenous processes of formation of ore minerals		
Learning Outcomes: 1. Evaluate the various factors that control ore formation 2. Identify the processes of ore mineral formation by Magmatic concentration, Hydrothermal processes, sublimation and Contact Metasomatic processes 3. Differentiate between various endogenous processes		
1.1	Ores, gangue minerals, tenor, grade and lodes Resources and reserves Economic and Academic definitions Metallic, industrial and strategic minerals.	

1.2	Mineral deposits and classical concepts of ore formation. Endogenous processes: Magmatic concentration, skarns, greisen and hydrothermal deposits.	
Module 2	**Exogenous processes and distribution of Economic minerals in India**	**[15L]**
Learning Objectives: 1. Explain the various exogenous processes of formation of ore minerals 2. Understand metallogenic epochs and provinces 3. Learn the formation, association and Indian distribution of major metallic ore minerals 4. Learn the formation, association and Indian distribution of major non-metallic ore minerals		
Learning Outcomes: After the successful completion of the module, the learner will be able to: 1. Explain the various exogenous processes of formation of ore minerals 2. Learn the factors that affect the formation of ore minerals by exogenous processes 3. Enumerate the different geographical and geological distribution of major metallic ore minerals and non-metallic ore minerals in India		
2.1	Exogenous processes: weathering products and residual deposits, oxidation and supergene Enrichment, placer deposits. Distribution of ores and minerals Metallogenic provinces and epochs	
2.2	Important deposits of India including atomic minerals Non- metallic and industrial rocks and minerals, in India.	

References:

1. Misra, K. (2012). Understanding Mineral Deposits. Germany: Springer Netherlands.
2. Deb, M., Sarkar, S. C. (2017). Minerals and Allied Natural Resources and Their sustainable Development: Principles, Perspectives with Emphasis on the Indian Scenario. Singapore: Springer Nature Singapore.
3. Bateman, A.M. and Jensen, M.L. (1990) Economic Mineral Deposits. John Wiley. 37
4. Evans, A. M. (2013). Ore Geology and Industrial Minerals: An Introduction. Germany: Wiley.
5. Robb, L. (2020). Introduction to Ore-Forming Processes. United Kingdom: Wiley.
6. Gokhale, K.V.G.K.and Rao, T.C. (1978) Ore deposits of India their distribution and processing, Tata-McGraw Hill, New Delhi.
7. Prasad, U. (2005). Economic Geology : Economic Mineral Deposits, 2e. India: CBS Publishers & Distributors.

Question Paper Template

F.Y. B. Sc. (Geology) SEMESTER II

Major Core Course- II

COURSE TITLE: Economic Geology

COURSE CODE: 23US2GEMJ2EGE [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	5	5	5	5	-	25
II	5	15	5	-	-	-	25
Total marks per objective	10	20	10	5	5	-	50
% Weightage	20	40	20	10	10	-	100

F. Y. B. Sc. (Geology)

SEMESTER II - Practical

COURSE TITLE: Structural Geology and Plate Tectonics Practical

COURSE CODE: 23US2GEMJ1P Credit- 01

Learning Objectives: To provide practical tools for different structural techniques used in industry / exploration organisations.
Learning Outcomes: 1. Learn about Structural Geological problems 2. Learn interpretation of geological maps 3. Learn projection of structural data in stereographic plots
List of Practical
1. Basic idea of topographic maps 2. Three-point problems 3. Understanding topographic maps at different scales 4. Interpretation of geological maps with unconformities, fold, faults, igneous intrusions and construction of geological cross sections 5. Stereographic projection of lines and planes

F. Y. B. Sc. (Geology)

SEMESTER II - Practical

COURSE TITLE: Economic Geology Practical

COURSE CODE: 23US2GEMJ2P Credit- 01

Learning Objective
Learn to identify different metallic and non-metallic ores from their megascopic properties and apply the knowledge to identify in the field.
Learning Outcomes
1. Learn identification of ore minerals in hand specimen 2. Identification of gangue constituents and associated minerals to understand the depositional setting 3. Learn the Indian distribution and deposit types.

List of practical
1. Identification with the help of physical properties, chemical composition and origin 2. Indian occurrences and geographical distribution of the following Metallic and Non-Metallic economic minerals: Limestone, Baryte, Bauxite, Magnesite, Mica, Coal, Biotite, Calcite, Dolomite, Fluorite, Garnet, Kyanite, Muscovite, Serpentine, Talc, Tourmaline, Barytes, Bauxite, Chalcopyrite, Chromite, Cuprite, Galena, Graphite, Gypsum, Hematite, Ilmenite, Limonite, Magnetite, Malachite, Psilomelane, Pyrite, Pyrolusite, Sphalerite, Stibnite. 3. Geographic distribution of important mines of India. 4. Geographic distribution of important minerals of Maharashtra.

8. Teaching learning process

The pedagogic methods adopted, involve direct lectures, tutorial discussions, as well as technology- supported presentations. We believe that education is interactive and all sessions between students and teachers are based upon reciprocity and respect.

1) The lectures (of 1 hr duration) delivered to one whole class at a time systematically deal with the themes of the syllabus. This constitutes the core of the teaching- learning process. The students are provided with bibliographic references and encouraged to go through at least some readings so that they could be more interactive and ask more relevant questions in the class. This also helps obtain knowledge beyond the boundaries of the syllabi.

2) Wherever needed, teachers use audio-video based technology devices (e. g. power point, YouTube videos) to make their presentations more effective. Some courses require that students see a documentary or feature film and course themes are structured so that discussions of these will further nuance the critical engagement of students with ideas introduced in their textual materials.

3) Remedial coaching, bridge courses are adopted to enhance the scope of learning for the learners. Remedial sessions are conducted to offer assistance on certain advanced topics. Bridge courses facilitate to develop a concrete basis for the topics to be learnt in the coming academic year.

9. Assessment Methods

Evaluation Pattern: Theory

- Assessments are divided into two parts: Mid Semester Examination (MSE) and End Semester Examination (ESE).
- The Mid Semester Examination shall be conducted by the College at the Mid of each semester (20 M) – Duration: 30 Min.
- The End Semester Examination shall be conducted by the College at the end of each semester. (30M) Duration: 1 hours

  End Semester Examination Paper Pattern

Question No	Module	Marks with Option	Marks without Option
1	I	5 M x 5 Q = 25 M	3 M x 5 Q = 15 M
2	II	5 M x 5 Q = 25 M	3 M x 5 Q = 15 M

Each question will have six sub questions a, b, c, d, e, f and out of which any three should be answered.

Evaluation pattern: Practical

- Continuous Assessment for 50 Marks throughout entire semester.
- 50 Marks Evaluation as per the following rubrics

Major Core Course	CIE	Experimental Report	Viva	Total
MJ I	15 M	5 M	5 M	25 M
MJ I	15 M	5 M	5 M	25 M

10. Programme and Course Code Format

The course is coded according to following criteria:

1. First two numbers in each course code indicates year of implementation of syllabus (23- year of implementation is 2023-24)
2. Third letter 'U' designates undergraduate
3. Fourth letter 'S' designate Science discipline and the digit followed is for semester number (S1 – 1st Semester)
4. Letter 'GE' is for Geology discipline (GE- Geology). This forms the programme code 23USGE. For the further course codes programme code is amended as follows
5. To represent Major Core Course (MJ) followed by course number digit (1/2/3/4) and three lettered code representing the title of the course.
6. To represent Minor Stream Course (MN) followed by course number digit (1/2/3/4) and three lettered code representing the title of the course.
7. For Ability enhancement course code, (AE) alphabets followed by a digit (1/2) followed by 'FOC'- Foundation course, 'EVS'-Environmental science are used.
8. For Value Added course code, (VA) alphabets followed by a digit (1/2) followed by 'FOC'- Foundation course, 'EVS'-Environmental science are used.
9. For Indian Knowledge System course code, (IK) alphabets followed by a digit (1/2) followed by 'ICH'- Indian Cultural Heritage is used.
10. For Co-curricular course code, (CC) alphabets followed by a digit (1/2).
11. For Open Elective course code, (OE) alphabets followed by a digit (1/2).
12. 'P' followed by digit indicates practical course number. (Practical course number will be added for semesters only where there is more than one course.