



SOMAIYA
VIDYAVIHAR

K J Somaiya College of Science & Commerce
Autonomous (Affiliated to University of Mumbai)



Learning Outcomes based Curriculum Framework

(LOCF)

For

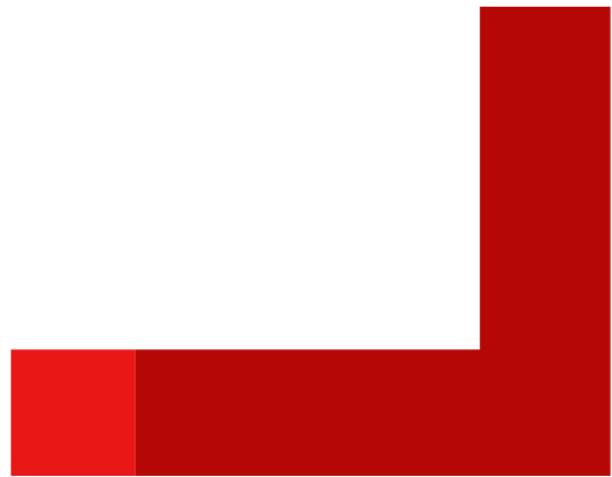
B.Sc. Geology

Undergraduate Programme

From

Academic year

2021-22





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

Undergraduate and Postgraduate

	Name	Designation	Institute/Industry
Head of the Department			
1	Deepak Kumar Sahu	Chairman	K. J. Somaiya College of Science and Commerce
Subject Expert nominated by Vice-Chancellor			
1	Prof. P. K. Saraswati	Professor	IIT-Mumbai
Subject experts			
1	Prof. Hetu Sheth	Professor	IIT-Mumbai
2	Dr. Balamurugan	Associate Professor	TISS-Mumbai
3	Dr. Pravin Henriques	Associate Professor	St. Xaviers College, Autonomous
4	Dr. Raymond Duraiswami	Assistant Professor	S P Pune University
5	Dr. Bobby P Mathew	Associate Professor	St. Xaviers College, Autonomous
6	Dr. Durga P Mohanty	Assistant Professor	S P Pune University
Representative from Industry/corporate sector/allied area			
1	Mr. Bipin Gedam	Reservoir geologist	ONGC, Mumbai
Meritorious Alumnus			
1	Ms. Astha Tyagi	M.Sc. Part II	K. J. Somaiya College of Science and Commerce
Faculty of the specialisation			
1	Dr. Jyoti Sharma	Assistant Professor	K. J. Somaiya College of Science and Commerce
2	Dr. Dnyanada Salvi	Assistant Professor	K. J. Somaiya College of Science and Commerce



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3	Dr. Asmita Singh	Assistant Professor	K. J. Somaiya College of Science and Commerce
4	Mr. Siddharth Kshtriya	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 colleges carry 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



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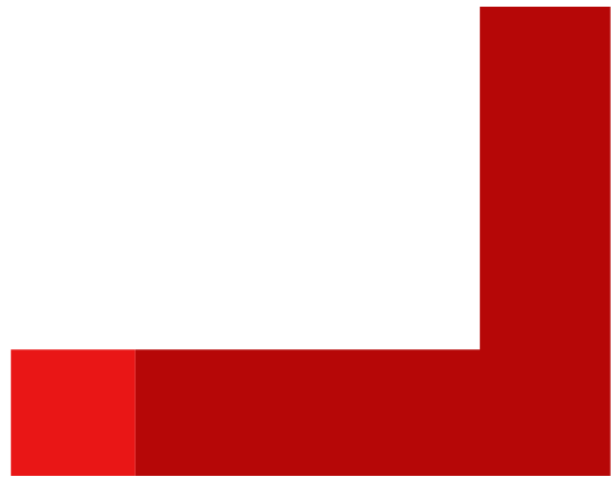
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faculty, supported by several hands have been our unique outstanding propositions. All efforts have been made to nurture the academic ambitions as well as the skills in co-curricular activities of the most important stakeholder i. e. student.

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





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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 is a part of our daily lives from the floors that we walk on, to the salt in our food. The study of geology is the study of how the Earth and its constituents like atmosphere, hydrosphere are formed and how they are inter-connected with each other. It also involves the study of the evolution of life in all its forms and how biology and climate have changed over the course of the Earth's lifetime.

The graduate coursework in Geology intends to introduce the students to the basic principles that govern the evolution of life and formation and deformation of rocks. It aims to introduce and inculcate an understanding of the classification, identification and structure of different life forms, minerals, crystal forms and rocks and develop the ability to understand the fundamental processes involved in the preparation of geological maps, prospecting for economic minerals and groundwater study, The application of these core concepts towards various fields of geologic and geomorphic investigation, navigation, communication and disaster management as well as understanding the interaction between the lithosphere, atmosphere and biosphere throughout geological time forms a major portion of the coursework.

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 the 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.

The primary objective of the programme is to hone the students' skill sets and induce creative thinking abilities that can utilise the core concepts of geology in innovative research projects and new developments. Taking into account the global prerequisites of employability, the institute envisages to provide a focused, outcome-based syllabus that can manoeuvre the academic journey towards achieving excellence.

The programme also states the attributes that it offers to inculcate at the graduation level. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, ethical behaviour and also skills for employability. The programme fosters scientific temperament and problem-solving skills among the

learners and the theory and practical have been designed to bring out the intellectual potential of the learner.

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.

2.1 Nature and extent of B.Sc. Geology

The Degree programme in Geology is designed to include the latest and core topics from different branches of Geology. The scope of individual topics varies with the nature of specific Geology branches. In our endeavour to improve the employability of graduates of the Geology programme, the curriculum offers courses on skills in Geology and Remote Sensing analysis. The B.Sc. Geology programme is of three years duration. Each year is divided into two semesters.

The first two semesters of the course introduce the learners to the principal branches of Geology such as stratigraphy, mineralogy, crystallography, geomorphology and mapping. Over the course of the next four semesters, the learners are introduced to each branch of geology in greater detail, with a view towards understanding their core concepts and application of these concepts for further studies.

2.2 Programme Education Objectives (PEOs)

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

1. Discuss the basics of Geology and various geomorphological processes of earth, ocean and atmosphere and their contribution to formation of different landforms
2. Describe the origin, evolution and preservation of life in sedimentary rocks through study of microfossils; Understanding the fundamentals of Stratigraphy, stratigraphic succession and stratigraphic correlation
3. Learn optics theory and understanding of mineral optics. To bring out the aspects of most common minerals and their petrological associations descriptively
4. Acquaint with the endogenic and exogenic processes responsible for generation of ore bodies and understand the basics of groundwater hydrology, its occurrence and several exploration techniques
5. Recognize the different optical properties and learn to identify minerals in thin-section based on these properties
6. Comprehend the interior structure of Earth and role of magma in formation of different types of igneous, sedimentary and metamorphic rocks
7. Comprehend the geochemistry of solar system, climate change and its influence on the Earth, significance of geological aspects and applications of remote sensing and GIS in urban development
8. Explain the basic concepts of structural geology and identify the suitable geological sites and rocks for building any engineering structure
9. Develop skills for geological field mapping and preparation of topographical maps, geological maps and identification of geomorphic forms to help in geological mapping

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:** Role of Geology while addressing environmental issues.
- GA 3:** Proficiency in qualitative and quantitative laboratory techniques
- GA 4:** Ability to construct a research problem and communicate the results of scientific work in oral, written and e-formats.
- GA 5:** Sense of critical thinking and problem-solving skills in theoretical and applied Geology.
- GA 6:** Enthusiasm for working individually and in diverse teams through interdisciplinary projects.
- GA 7:** Respect for professional ethics and responsibilities of the Geological science practice
- GA 8:** Knowledge of subject-related and transferable skills that are relevant to Geology related job trades and employment opportunities

4. Qualification descriptors

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 career paths provided by an undergraduate training in Geology:

1. Academics
2. Research
3. Oil and petroleum industry
4. Mining Industry
5. Remote Sensing and GIS
6. Water resources and management
7. Gemmology
8. Meteorology
9. Ceramics industry
10. Cement industry

Job Roles for B.Sc. Geology graduate:

After graduation one can seek a professional career as:

1. Lab Assistant/Geologist
2. R & D Geologist
3. Quality control Geologist
4. Academist



5. Environment analyst
6. Project fellow
7. Entrepreneur
8. Civil services
9. Competitive exams

Higher Education options for B.Sc. Geology graduate:

1. Masters in Geology/Applied Geology, Marine Geology, Geophysics, Petroleum Geosciences, Geoinformatics at various reputed institutes
2. Integrated M.Sc.-Ph.D in Geology (IISER Kolkata, IIT Kharagpur)
3. Post-graduate studies at IIT
4. Courses in Management
5. Bachelors of Education

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 Learning Outcomes (PLOs)

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

PLO I: Comprehend the basics of all the disciplines of Geology

PLO II: Relate the various geological processes of Earth's evolution and classify the rocks, fossils and minerals within

PLO III: Apply the knowledge of Geology in core subjects and applied branches

PLO IV: Interpret the geological maps, structural and engineering problems and analyse satellite imagery for different landforms and economic deposit

PLO V: Demonstrate the ability to use skills of Geology and its related areas of technology for formulating and tackling geoscience and environmental related problems

PLO VI: Develop the aptitudes and dispositions necessary to help democratise society by obtaining and maintaining employment as a professional geologist

5.1 Course Mapping

Semester	PLO	I	II	III	IV	V	VI
	Course						
I	CC I	√	√	√	√	√	√
	CC II	√	√	√	√	√	√
	AECC I FC*						
	SEC I STPI						
	SEC II BCE**						
II	CC I	√	√	√	√	√	√
	CC II	√	√	√			√
	AECC I FC*						
	SEC I STP2						
	SEC II ICHI***						
III	CC I	√	√	√	√		√
	CC II	√	√	√			√
	CC III	√	√	√	√	√	√
	AECC I FC*						
	SEC I						

	STP3						
	SEC II ICH2***						
IV	CC I	√	√	√	√	√	√
	CC II	√	√	√			√
	CC III	√	√	√	√	√	√
	AECC I FC*						
	SEC I STP4						
	SEC II ICH3***						
V	CC I	√	√	√	√		√
	CC II	√	√	√	√		√
	CC III	√	√	√	√	√	√
	CC IV	√	√	√	√	√	√
	DSE I	√	√	√	√	√	√
	DSE II	√	√	√	√	√	√
	DSE III	√	√	√	√	√	√
	DSE IV	√	√	√	√	√	√
	AECC I EVS						
	SEC I	√	√	√	√	√	√
	SEC II	√	√	√	√	√	√
VI	CC I	√	√	√			√
	CC II	√	√	√			√

	CC III	√	√	√			√
	CC IV	√	√	√	√	√	√
	DSE I	√	√	√	√	√	√
	DSE II	√	√	√	√	√	√
	DSE III	√	√	√	√	√	√
	DSE IV	√	√	√	√	√	√
	AECC I EVS						
	SEC I	√	√	√	√	√	√
	SEC II	√	√	√	√	√	√

* FC = Foundation Course

** BCE = Basic communication in English

*** ICH = Indian Cultural Heritage (Value Education)

6. Structure of B.Sc. Geology programme

The curriculum framework is designed around the choice-based credit system (CBCS). The programme consists of three years and six semesters (two semesters per year). To acquire a degree in B.Sc. Geology a learner must study

1. Core Courses (CC):

- A course which is required to be opted by a candidate as a core course.
- There are eighteen Core courses (CC), two each, in semesters I and II; three each in semesters III and IV and four each in semesters V and VI (for 6 units).
- Each Core Course is compulsory.
- Each CC consists of 2 credits for theory ie. 30 hour; 3 lectures of each 50 min per week and 1 credit for practical of two hour per week in every semester.

- e) The purpose of fixing 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.
- f) The course designed under this category aims to cover the basics that a student is expected to imbibe in that particular discipline.

2. Ability Enhancement Compulsory Courses (AECC):

- a) There are six AECC courses. Students must take two Ability Enhancement Compulsory Courses (AECC) in semester I and one AECC each in semesters II-VI.

- b) The AECC courses offered are:

AECC 1- Foundation Course (2 credits) (Semester I-IV)

AECC 2- Environmental Science (2 credits) (Semester V and VI)

3. Skill Enhancement Course (SEC):

- 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 Twelve skill enhancement courses offered. Each student is supposed to take two in each semester I-IV (Sports training program, Basic communication in English and Indian Cultural Heritage) of 1 credit each. There are four discipline-related skill enhancement courses (SEC), two offered in each semester V and semester VI each of 2 credit. The student is supposed to choose one SEC in Semester V and VI.



4. Discipline Specific Elective Courses (DSE):

- a) Elective courses offered under the main discipline subject of study.
- b) There are eight discipline specific elective courses (DSE), four in each semester V and VI. The student is supposed to choose two out of four in each semester V and VI.
- c) Each DSE theory course is of 2 credits i.e. 30 hour; 3 lectures of each 50 min per week and 1 credit for practical of two hour per week in every semester.
- d) Research Project is offered as an option for the student to choose in lieu of a regular DSE course.

5. Generic Elective Course (GE):

- a) Students can opt for one interdisciplinary Generic Elective Course (GE) in each of the semester V and VI.
- b) Generic elective courses are offered in cognate disciplines by different departments in the college.
- c) Credits for these courses are granted as additional credits.

6.1 Content

Sr. No	Semester	Course number	Course Code	Course title
Core Course (CC)				
1	I	CC I	2IUSIGECCISEA	Study of Earth, Atmosphere and Oceans
2		CC II	2IUSIGECC2MCM	Mineralogy, Crystallography and Mineral Deposits
3		CC P	2IUSIGECCP	Based on CC I and CC II
4	II	CC I	2IUS2GECCIPST	Petrology, Structural Geology, Geo tectonics
5		CC II	2IUS2GECC2SPF	Stratigraphy, Palaeontology and Morphology of Fossils
6		CC P	2IUS2GECCP	Based on CC I and CC II
7	III	CC I	22US3GECCIPSP	Principles of Stratigraphy and Palaeontology
8		CC II	22US3GECC2CTG	Crystallography
9		CC III	22US3GECC3GMP	Geomorphology
10		CC P	22US3GECCP	Based on CC I, CC II and CC III
11	IV	CC I	22US4GECCIEGE	Economic Geology
12		CC II	22US4GECC2OPM	Optical Mineralogy and Systematic Mineralogy

13		CC III	22US4GECC3GHY	Geohydrology
14		CC P	22US4GECCP	Based on CC I, CC II and CC III
15	V	CC I	23US5GECCIPCS	Geology of India: Precambrian Stratigraphy
16		CC II	23US5GECC2GPI	Igneous Petrology: Evolution of Igneous rock
17		CCP I	23US5GECCPI	Based on CC I and CC II
18		CC III	23US5GECC3STG	Structural Geology
19		CC IV	23US5GECC4SDG	Sedimentary Geology
20		CC P II	23US5GECCP2	Based on CC III and CC IV
21		VI	CC I	23US6GECCIPHS
22	CC II		23US6GECC2IGP	Igneous Petrology: Textures and structures
23	CC P I		23US6GECCPI	Based on CC I and CC II
24	CC III		23US6GECC3MTP	Metamorphic Petrology
25	CC IV		23US6GECC4ENG	Engineering Geology
26	CC P II		23US6GECCP2	Based on CC III and CC IV
Discipline Specific Electives (DSE)				
1	V	DSE I	23US5GEDSIEOG	Element of Geochemistry
2		DSE II	23US5GEDS2RSG	RS-GIS
3		DSE III	23US5GEDS3EXG	Exploration Geology
4		DSE IV	23US5GEDS4GEH	Geohazards
5		DSE P	23US5GEDSP	Practical Based on DSE Courses
6	VI	DSE I	23US6GEDSIEAC	Earth and Climate

7		DSE II	23US6GEDS2UBG	Urban Geology
8		DSE III	23US6GEDS3ELT	Evolution of life through time
9		DSE IV	23US6GEDS4IGP	Introduction to Geophysics
10		DSE P	23US6GEDSP	Practical Based on DSE Courses
Skill Enhancement Courses (SEC)				
1	I	SEC I	21USISE1STP1	Sports Training Programme Level I
2		SEC II	21USISE2BCE	Basic Communication in English
3	II	SEC I	21US2SE1STP2	Sports Training Programme Level II
4		SEC II	21US2SE21CHI	Indian cultural Heritage Level I (value education)
5	III	SEC I	22US3SE1STP3	Sports Training Programme Level III
6		SEC II	22US3SE21CH2	Indian cultural Heritage Level II (value education)
7	IV	SEC I	22US4SE1STP4	Sports Training Programme Level IV
8		SEC II	22US4SE21CH3	Indian cultural Heritage Level III (value education)
9	V	SEC I	23US5GESEIFGO1	Field Geology I: Economic Geology and Mining
10		SEC II	23US5GESE2BGS	Basics of Geo-statistics
11	VI	SEC I	23US6GESEIFGO2	Field Geology-II
12		SEC II	23US6GESE2LBP	Laboratory preparation

Ability Enhancement Compulsory Course (AECC)				
1	I	AECC I	2IUS1AEIFOC	Foundation Course
2	II	AECC I	2IUS2AEIFOC	Foundation Course
3	III	AECC I	22US3AEIFOC	Foundation Course
4	IV	AECC I	22US4AEIFOC	Foundation Course
5	V	AECC I	23US5AEIEVS	Environmental Science
6	VI	AECC I	23US6AEIEVS	Environmental Science

6.2 Credit distribution for B.Sc. Geology

Semester	Course number	Course title	Credits		
			Theory	Practical	Total
I	CC I	Study of Earth, Atmosphere and Oceans	2	1	3
	CC II	Mineralogy, Crystallography and Mineral Deposits	2	1	3
	AECC I	Foundation Course	2		2
	SEC I	Sports Training Programme Level I	1		1
	SEC II	Basic Communication in English	1		1
II	CC I	Petrology, Structural Geology, Geo tectonics	2	1	3
	CC II	Stratigraphy, Palaeontology and Morphology of Fossils	2	1	3
	AECC I	Foundation Course	2		2

	SEC I	Sports Training Programme Level II	1		1
	SEC II	Indian cultural Heritage Level I (value education)	1		1
III	CC I	Principles of Stratigraphy and Palaeontology	2	1	3
	CC II	Crystallography	2	1	3
	CC III	Geomorphology	2	1	3
	AECC I	Foundation Course	2		2
	SEC I	Sports Training Programme Level III	1		1
	SEC II	Indian cultural Heritage Level II (value education)	1		1
IV	CC I	Economic Geology	2	1	3
	CC II	Optical Mineralogy and Systematic Mineralogy	2	1	3
	CC III	Geohydrology	2	1	3
	AECC I	Foundation Course	2		2
	SEC I	Sports Training Programme Level IV	1		1
	SEC II	Indian cultural Heritage Level III (value education)	1		1
V	CC I	Precambrian Stratigraphy	2	1	3
	CC II	Igneous Petrology: Evolution of Igneous Rock	2	1	3

	CC III	Structural Geology	2	1	3
	CC IV	Sedimentary Geology	2	1	3
	DSE I/II	Elements of Geochemistry/ RS-GIS	2	1	3
	DSE III/IV	Exploration Geology/ Geohazards	2	1	3
	AECC I	Environmental Science	2		2
	SEC I/II	Field Geology 1 - Economic Geology and Mining / Basics of Geo-statistics	2		2
VI	CC I	Phanerozoic Stratigraphy	2	1	3
	CC II	Igneous Petrology:Textures and Structures	2	1	3
	CC III	Metamorphic Petrology	2	1	3
	CC IV	Engineering Geology	2	1	3
	DSE I/II	Earth and Climate/Urban Geology	2	1	3
	DSE III/IV	Evolution of life through time / Introduction to Geophysics	2	1	3
	AECC I	Environmental Science	2		2
	SEC I/II	Field Geology - II / Laboratory preparation	2		2

6.3 Semester Schedule

Semester	Core Course number	Core Course (CC) title	Discipline Specific Electives (DSE)	Generic Elective Course (GE)	Skill Enhancement Course (SEC)	Ability Enhancement Compulsory Course (AECC)
I	CC I	Study of Earth, Atmosphere and Oceans	-	-	1] Sports Training Programme Level I	Foundation Course
	CC II	Mineralogy, Crystallography and Mineral Deposits	-	-	2] Basic Communication in English	
II	CC I	Petrology, Structural Geology, Geotectonics	-	-	1] Sports Training Programme Level II	Foundation Course
	CC II	Stratigraphy, Palaeontology and Morphology of Fossils	-	-	2] Indian cultural Heritage Level I (Value Education)	
III	CC I	Principles of Stratigraphy	-	-	1] Sports Training	Foundation Course

		and Palaeontology			Programme Level III	
	CC II	Crystallography	-	-	2] Indian cultural	
	CC III	Geomorphology	-	-	Heritage Level II (Value Education)	
IV	CC I	Economic Geology	-	-	1] Sports Training	Foundation Course
	CC II	Optical Mineralogy and Systematic Mineralogy	-	-	Programme Level IV 2] Indian cultural	
	CC III	Geohydrology	-	-	Heritage Level III (Value Education)	
V	CC I	Precambrian Stratigraphy	DSE I/II and DSE III/IV	GE	SEC I/II	Environmental Science
	CC II	Igneous Petrology: Evolution of Igneous Rock				
	CC III	Structural Geology				



	CC IV	Sedimentary Geology				
VI	CC I	Phanerozoic Stratigraphy	DSE I/II and DSE III/IV	GE	SEC I/ II	Environmental Science
	CC II	Igneous Petrology: Textures and Structures				
	CC III	Metamorphic Petrology				
	CC IV	Engineering Geology				



6.4 Course Learning Objective

The three-year undergraduate Geology programme is designed to familiarize students with significant developments in Geology. The objective of structured syllabus in Geology is to make the concepts and basics of Geology clear and interesting to students and also to ensure the development of vertical growth in the subject. The idea behind this is to enable students to develop analytical skills and critical thinking.

It is our attempt that students achieve this objective through systematic reading and class lectures and through feedback on their written work-assignments, project/research papers, presentations, discussions, debates, etc. Our intention is to enable students to formulate cogent arguments, presenting the necessary evidence to establish these, based on a training in Geology.

7. Detailed B.Sc. Geology Syllabus

F. Y. B.Sc. Syllabus with effect from the Academic year 2021–2022

Syllabus - F. Y. B.Sc. Geology

Course No.	Course Title	Course Code	Credits	Hr.	Periods (50 min)	Module	Lectures per module (50 minutes)	Examination		
								Internal Marks	External Marks	Total Marks
SEMESTER I										
Core courses THEORY										
I	Study of Earth, Atmosphere and Oceans	2IUSIGECCI SEA	2	30	36	3	12	40	60	100
II	Mineralogy, Crystallography and Mineral Deposits	2IUSIGECC2 MCM	2	30	36	3	12	40	60	100
Core courses PRACTICAL										
		2IUSIGECCP	2	75	90			40	60	100
SEMESTER II										
Core courses THEORY										
I	Petrology, Structural Geology, Geotectonics	2IUS2GECCI PST	2	30	36	3	12	40	60	100
II	Stratigraphy, Palaeontology and Morphology of Fossils	2IUS2GECC 2SPF	2	30	36	3	12	40	60	100
Core courses PRACTICAL										
		2IUS2GECC P	2	75	90			40	60	100

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

Core Course- I

COURSE TITLE: Study of Earth, Atmosphere and Oceans

COURSE CODE: 2IUSIGECCISEA [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Identify the basic processes involved within the Earth 2. List various methods for calculation of the age of the Earth 3. Comprehend interactivity between the hydrosphere, atmosphere, biosphere and lithosphere 4. Discriminate the various geomorphological features carved by the geological agents 5. Explain the process of soil formation and soil types 		
Module I	Solid Earth	[12L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. State perspectives of geology 2. Infer Earth's internal structure and formation of solar system 3. Analyse the age of the Earth 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 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. Earth in the Solar system: Origin, size, shape, mass, density, rotational parameters. Internal structure: core, mantle, and crust	[4L]
1.2	Continental and Oceanic Crust, Introduction to Plate Tectonics and Mantle Convection Convection in the Earth's core and production of its magnetic field	[4L]
1.3	Radioactivity Age of the earth	[4L]
Module 2	Hydrosphere and Atmosphere	[12L]
<p>Learning Objectives: This module is intended to:</p> <ol style="list-style-type: none"> 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 		
<p>Learning Outcomes: After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Illustrate the Hydrological cycle 2. Identify the ocean relief features 3. Relate the elements of Oceanic and Atmospheric Circulation 		
2.1	Hydrological Cycle, General relief features of Ocean floor, beach and coastline	[4L]
2.2	Ocean Currents Climate and Weather associated hazards	[3L]
2.3	Structure of Atmospheric circulation	[3L]

2.4	Ocean currents	[2L]
Module 3	Physical Geology	[12L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. Explain different types of weathering and erosion processes 2. Illustrate the erosive and depositional activities of geological agents 3. Describe the formation of soil 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Identify the different features produced by weathering and erosion 2. Differentiate the morphology produced by river, wind or glacial action 3. Recognize the types of soil and their characteristics 		
3.1	Weathering and Erosion	[2L]
3.2	Soil: definition, formation and functions; soil profile and soil types	[2L]
3.3	Rivers: development of a typical river system, source and surface flow; erosion, transportation and deposition	[4L]
3.4	Wind: erosion, transport and deposition; types of deserts and dunes; loess Glaciers: types, formation and morphology; erosion, transport and deposition	[4L]
<p>References:</p> <ul style="list-style-type: none"> • Bloom, A.L. 1998. Geomorphology: A systematic Analysis of Late Cenozoic Landforms (3rd Edition), Pearson Education, Inc. 		



- Kale, VS. and Gupta, A. 2001. Introduction to Geomorphology. Orient Longman Ltd.
- Holme's Principles of Physical Geology. 1992. Chapman & Hall.
- M.A. Summerfield, 1991. Global Geomorphology. Wiley & Sons.
- Judson, Kauffman and Leeds, 1987. "Physical Geology" (VII edition). Prentice Hall.
- Siddhartha. K., 2014. "Oceanography – A Brief Introduction". Kisalaya Publications, India
- Skinner, B.J., Porter, S.C. and Botkin, D.B., 1994. Blue Planet: An Introduction to Earth System Science. Laboratory Manual. John Wiley & Sons.



Question paper Template

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

Core Course- I

COURSE TITLE: Study of Earth, Atmosphere and Oceans

COURSE CODE: 2IUSIGECCISEA [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	11	08	05	03	03		30
II	13	09	03	03	02		30
III	10	09	06	03	02		30
Total marks per objective	34	26	14	09	07		90
% Weightage	38	29	16	10	07		100

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

Core Course- II

COURSE TITLE: Mineralogy, Crystallography and Mineral Deposits

COURSE CODE: 2IUSIGECC2MCM [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Explain the optical and physical properties of minerals in hand specimen 2. Discuss the basics of economic geology 3. Identify the minerals belonging to different mineral groups based on the structure of crystal lattice and its symmetry and class 4. Differentiate between different types of economic mineral deposits based on their origin 		
Module 1	Mineralogy	[12L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. Discuss chemical bonds and chemical composition 2. Describe silicate structure 3. Classify physical properties of minerals 4. Identify the rock forming minerals group 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Paraphrase different physical properties of minerals which are used to identify minerals 2. Distinguish between mineral groups based on different mineral properties 		
1.1	Chemical bonds, Chemical compositions and Classification, Silicate Structures, Physical properties of minerals: colour,	[4L]

	streak, luster, diaphaneity, form, habit, cleavage, fracture, hardness, specific gravity, electrical and magnetic properties Isomorphism, polymorphism and pseudomorphism	
1.2	Introduction to rock forming minerals: Silica, Feldspars, Pyroxene, Amphibole, Mica, Olivine	[4L]
1.3	Ore-forming and industrial minerals	[4L]
Module 2	Crystallography	[12L]
<p>Learning Objectives: This module is intended to:</p> <ol style="list-style-type: none"> 1. Explain the concept of crystal lattice 2. Discuss the external characteristics of crystals 3. Differentiate normal classes of seven crystal systems 		
<p>Learning Outcomes: After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Paraphrase the elements of Crystal symmetry 2. Classify the seven crystal systems 3. Analyse the basic structure of crystal lattice and determine its symmetry and class 		
2.1	Concept of Crystal Lattice External characteristics of crystals: face, form, edge, solid angle, interfacial angle and its measurement	[4L]
2.2	Crystal symmetry: planes, axes and center of symmetry. Crystallographic axes and axial angles, parameters, indices and rational indices	[4L]
2.3	Classification of crystals into seven systems. Study of the normal classes belonging to following systems:	[4L]

	Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic	
Module 3	Mineral Deposit	[12L]
<p>Learning Objective:</p> <p>The module is intended to describe the processes of formations of economic mineral deposits and methods of exploration and mining techniques.</p>		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Explain the process of formation of hydrothermal, magmatic, sedimentary and placer deposits 2. Describe the surface and subsurface Methods of exploration 3. Discuss the basic terminology used in economic geology and distinguish between different types of mineral deposits based on their origin 		
3.1	Classification and brief study of following mineral deposits: Hydrothermal, Magmatic, Sedimentary (evaporites, strata-bound, bedded iron formations), Placer, Residual. Introduction to Mineral Exploration and Mining	[5L]
3.2	Methods of mineral exploration: Surface methods – grid sampling. Subsurface methods: Electrical, Magnetic and Electrical	[5L]
3.3	Basic ideas about the methods of mining	[2L]
<p>References:</p> <ul style="list-style-type: none"> ● Kerr, P. F., 1959. Optical Mineralogy. McGraw-Hill ● Klein, C., Dutrow, B., Dwight, J., & Klein, C., 2007. The 23rd Edition of the Manual of Mineral Science (after James D. Dana). J. Wiley & Sons. ● “Rutley’s Mineralogy”; Read H.H. (CBS) Mineralogy (II Edition) Dexter 		

Perkins PHI Learning Pvt. Ltd. New Delhi.

- P. K. Verma, 2009. Optical mineralogy, CRC press.
- Deer, W. A., Howie, R. A. and Zussman, J., 1962-1963. An introduction to the rock forming minerals, ELBS publication

Question Paper Template

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

Core Course- II

COURSE TITLE: Mineralogy, Crystallography and Mineral Deposits

COURSE CODE: 2IUSIGECC2MCM [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	07	10	05	05	03		30
II	09	09	06	03	03		30
III	09	06	05	05	05		30
Total marks per objective	25	25	16	13	11		90
% Weightage	28	28	18	14	12		100

F. Y. B. Sc. (Geology)

SEMESTER I - Practical

COURSE CODE: 2IUSIGECCP Credit- 02

Learning Objectives:

The Practical is intended to

1. Acquaint students with the various rocks based on the properties
2. Identify the processes of mineral formation and economic deposits

Learning Outcome:

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

1. Identify the different rocks (sedimentary, igneous and metamorphic)
2. Classify the crystal system of the minerals
3. Recognize the different industrial and ore minerals

Core Course I

1. Study of thirty crystal models representing forms of seven normal classes of symmetry

Core Course II

Identification and description of the physical properties, composition, occurrences and uses of 30 minerals comprising rock forming, industrial and ore minerals

References:

- Kerr, P. F., 1959. Optical Mineralogy. McGraw-Hill
- Klein, C., Dutrow, B., Dwight, J., & Klein, C., 2007. The 23rd Edition of the Manual of Mineral Science (after James D. Dana). J. Wiley & Sons.
- "Rutley's Mineralogy"; Read H.H. (CBS) Mineralogy (II Edition) Dexter Perkins PHI Learning Pvt. Ltd. New Delhi.
- P. K. Verma, 2009. Optical mineralogy, CRC press.
- Deer, W. A., Howie, R. A. and Zussman, J., 1962-1963. An introduction to the



rock forming minerals, ELBS publication,

- M. Agoskhov S. Borisov & V.Layansky, 1988. "Mining of Ores and Non-metallic Minerals"; (Mir Publications, Moscow) Ch.2 & Ch. 17
- Arogyaswami, R.N.P., 2017. "Courses in Mining Geology". Oxford & IBH.

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

Core Course- I

COURSE TITLE: Petrology, Structural Geology and Geo tectonics

COURSE CODE: 2IUS2GECCIPST [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Compare different types of rocks and the environmental conditions in which they were formed 2. Discuss the origin of different types of rocks based on their characteristics 3. Recognize the basics of geologic structure and its types 4. Analyse the metamorphic grade of rocks and their occurrence with respect to geo tectonics 5. Explain the process of formation of Earthquake, and how India is zoned based on seismicity 		
Module 1	Igneous and Sedimentary Petrology	[12L]
<p>Learning Objective:</p> <p>The module is intended to identify the process of formations of igneous and sedimentary rocks based on their textures and structures</p>		
<p>Learning Outcome:</p> <p>After the successful completion of the module, the learner will be able to explain the process that results in the formation of different igneous rocks based on their specific characteristics</p>		
1.1	<p>Igneous Rocks: Definition, their classification.</p> <p>Magma: definition, composition, Mode of occurrences, Intrusive and Extrusive forms, textures and structures.</p>	[4L]

1.2	Classification based on grain size and mineral composition. Origin, magmatic differentiation Volcanoes	[4L]
1.3	Sedimentary Rocks and Processes: Weathering, erosion, transport, deposition, consolidation, diagenesis. Textures and Structures. Classification: Terrigenous and Chemical, Residual, Biogenic sedimentary rocks.	[4L]
Module 2	Structural Geology	[12L]
<p>Learning Objective: This module is intended to explain the different types of geological structures that are observed in rocks and methods of their classification</p>		
<p>Learning Outcomes: After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Distinguish between different types of folds, faults and dipping strata and measure the strike and dip of structural entities 2. Discuss the types of unconformities and processes that result in their formation 		
2.1	Stratification; Dip and Strike; True dip and Apparent dip, Outcrop pattern of horizontal, dipping and vertical strata on various types of topography. Outliers, Inliers	[4L]
2.2	Folds: Definition, Morphology, anticline and syncline. Types of folds: symmetrical, asymmetrical, recumbent, overturned, isoclinal, plunging, anticlinorium, synclinorium, Importance of folds	[4L]

2.3	Joints: Definition, geometric classification and importance. Faults: morphology; Normal fault, Reverse, fault Thrust fault, Step fault, Nappes. Apparent movement and relative movement; Horsts, Grabens	[2L]
2.4	Concept of Unconformities, Introduction to Joints, shears and fractures	[2L]
Module 3	Metamorphism and Geo tectonics	[12L]
<p>Learning Objectives: The module is intended to</p> <ol style="list-style-type: none"> 1. Describe the mechanisms of formation of metamorphic rocks 2. Differentiate them in hand specimens and thin sections 		
<p>Learning Outcomes: After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Explain the mechanism of formation of different metamorphic rocks based on their structures and textures 2. Discuss the basic principles of plate tectonics and their effect on metamorphosis of rocks 		
3.1	Metamorphism and Geotectonics Metamorphism: definition, agents and types of metamorphism. textures and structures. Metamorphic facies and isograds	[6L]
3.2	Geotectonics: Isostasy. Earthquakes cause, effects, measurement of earthquakes, seismic belts, seismic zonation in India	[6L]

References:

- Robinson. A, Sale. R, Morrison. J, “Elements of Cartography”, 6 ed, J. Wiley & Sons.
- Billings M.P. 200. “Structural Geology” 3rd Edition. Prentice Hall
- Winter, J. D., 2014. Principles of igneous and metamorphic petrology. Pearson
- Best, M.G., 2001. Igneous and Metamorphic Petrology
- Willis, K.J. & McElwain, J.C. 2002. The evolution of plants, Oxford University Press.
- Brenchley, P. J., and Harper, D. A. T. 1998. Palaeoecology: Ecosystems, Environments and Evolution. By Chapman and Hall.
- Ghosh, S.K., 2013. Structural geology: fundamentals and modern developments. Elsevier.
- Park, R.G. and Park, G., 1989. Foundations of structural geology (p. 148). Glasgow and London: Blackie.
- Fossen, H., 2016. Structural geology. Cambridge University Press.

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

Core Course- I

COURSE TITLE: Petrology, Structural Geology, Geo tectonics

COURSE CODE: 2IUS2GECCIPST [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	10	10	05	03	02		30
II	11	09	05	03	02		30
III	08	07	05	05	05		30
Total marks per objective	29	26	15	11	09		90
% Weightage	33	29	17	12	09		100

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

Core Course- II

COURSE TITLE: Stratigraphy, Palaeontology, Morphology of Fossils

COURSE CODE: 2IUS2GECC2SPF [CREDITS - 02]

Course Learning Outcomes		
<p>After the successful completion of the Course, the learner will be able to:</p> <ol style="list-style-type: none"> Enumerate the basic principles of stratigraphy and its component types and correlate major events with respect to Geological time-scale Describe the process of fossilization and the conditions required for it to occur Distinguish between different types of fossils based on their morphological characteristics 		
Module I	Stratigraphy	[12L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> Classify the types of stratigraphic units Discuss the basic principles of stratigraphic correlation. 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> Describe the basic principles of stratigraphy and apply them for correlation between two units Describe the geological time scale in brief with respect to its chronostratigraphic units 		
1.1	Principles, correlation of strata, Unconformities and their significance	[4L]
1.2	Stratigraphic Units: Definition of Lithostratigraphic,	[4L]

	biostratigraphic and chronostratigraphic units	
1.3	Geological Time Scale	[4L]
Module 2	Palaeontology	[12L]
<p>Learning Objective:</p> <p>This module is intended to explain the different processes of fossilization and taxonomic principles followed to name them</p>		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Describe the process of preservation of organisms and preservation potential 2. Explain mass extinction 		
2.1	Definition and scope of Palaeontology	[4L]
2.2	Processes of fossilization, preservation potential of organisms	[5L]
2.3	Uses of fossils, zone fossils, Taxonomy, Mass Extinctions	[2L]
Module 3	Morphology of Fossils	[12L]
<p>Learning Objectives:</p> <p>The module is intended to</p> <ol style="list-style-type: none"> 1. Distinguish between the different groups of fossils based on their morphological characteristics 2. Identify the fossil and understand the significance of their presence in the strata 		
<p>Learning Outcomes:</p> <p>After the successful completion of the module, the learner will be able to:</p> <ol style="list-style-type: none"> 1. Describe the different invertebrate fossil groups with respect to their changing morphology 2. Explain the evolution of fossil groups due to environmental and geological factors 		

3.1	Systematic study of morphological characters, environmental factors and geological distribution of the various groups and their utility in palaeoenvironmental reconstructions: Trilobites, Brachiopods, Lamellibranchs, Gastropods, Cephalopods, Graptolites	[8L]
3.2	Significance of trilobites, brachiopods and graptolites in Palaeozoic biostratigraphy; Significance of ammonoids in Mesozoic biostratigraphy and palaeobiogeography; functional adaptations in ammonoids (sutures)	[4L]

References:

- DasGupta, A., 2012. An Introduction to Paleontology, The World Press Private Limited, Kolkata.
- Clarkson, E.N.K., 1998. Invertebrate Palaeontology and Evolution. George Allen & Unwin.
- Woods, H., 2004. "Invertebrate Paleontology" 8th Edition. CBS.
- Raup, D.M. and Stanley, S. M. 1971. Principles of Palaeontology, W.H. Freeman and Company.
- Benton, M. 1997. Basic Palaeontology: An introductory text, D.Harker, Addison Wesley Longman.
- Murray, J.W. 1985. Atlas of Invertebrate Macrofossils, Longman.
- Prothero, D.R. 1998. Bringing fossils to life – An introduction to Palaeobiology, McGraw Hill.
- Benton, M.J. 2005. Vertebrate palaeontology (3rd edition). Blackwell Scientific, Oxford.

Question Paper Template

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

Core Course- II

COURSE TITLE: Stratigraphy, Palaeontology and Morphology of Fossils

COURSE CODE: 2IUS2GECC2SPF [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	09	09	06	03	03		30
II	09	09	06	03	03		30
III	09	09	06	03	03		30
Total marks per objective	27	27	18	09	09		90
% Weightage	30	30	20	10	10		100

F. Y. B. Sc. (Geology)

SEMESTER II - Practical

COURSE CODE: 2IUS2GECCP Credit- 02

Learning Objectives:

The practical is intended to

1. Identifying the various geological features on map
2. Develop the use of toposheet, clinometer compass in undertaking geological field work
3. Impart knowledge of modes of fossilization and different invertebrate fossils

Learning Outcomes:

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

1. Differentiate between fossil groups on the basis of morphological features
2. Determine the age of the strata based on the fossils
3. Recognize the geological features on the map and construct the profile diagram of a given area based on the contour map
4. Identify the various symbols and features on the toposheet
5. Calculate the dip and strike of the beds with the help of the clinometer compass

Core Course I

1. Identification of group characteristics of 30 common rocks and their classification into major rock groups. Identification and systematic description of the megascopic features of these rocks
2. Identification, classification, and geological distribution of 15 fossils belonging to the phyla included in the theory syllabus. Study of Plant Fossils

Core Course II

1. Reading of topographical maps.
2. Use of Clinometer compass (Strike, Dip, Fore Bearing and Back Bearing)
3. Description and drawing of vertical cross section of simple geological maps involving horizontal strata, inclined, folded strata and strata involving angular unconformity with vertical dykes and vertical faults

References:

- DasGupta, A., 2012. An Introduction to Paleontology, The World Press Private Limited, Kolkata.
- Woods, H., 2004. "Invertebrate Paleontology" 8th Edition. CBS.
- Benton, M. 1997. Basic Palaeontology: An introductory text, D.Harker,

Addision Wisely Longman.

- Murray, J.W. 1985. Atlas of Invertebrate Macrofossils, Longman.
- Robinson. A, Sale. R, Morrison. J, "Elements of Cartography", 6 ed, J. Wiley & Sons.
- Billings M.P. 200. "Structural Geology" 3rd Edition. Prentice Hall

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 fifty minutes 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 the development of 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: Continuous Internal Assessment (CIA) & Semester End Examination.
- The Semester End Examination shall be conducted by the College at the end of each semester.
- Semester End Examination (external) (60 M)- Duration:
2 hours Paper Pattern

Question No	Module	Marks with Option	Marks without Option
1	I	30M	20M
2	II	30M	20M
3	III	30M	20M

i. For Internal Evaluation (40 M)

ii. Mid Sem Examination 25 M

iii. Seminar/ Assignment/ Research paper review 15 M

Evaluation pattern: Practical

- Semester-end evaluation: 30 Marks practical examination for each Course at the end of semester.
- Continuous internal evaluation 20 marks as per the following rubrics

Experimental Work	Experimental Report	Quiz	Total
10 M	5M	5M	20M

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 (21- year of implementation is 2021-22)
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 'G' is for Geology discipline (G- Geology)

This forms the programme code 21USGE. For the further course codes programme code is amended as follows

5. To designate the semester, add the digit (1-6) after S in the programme code. (Eg: 21USIGE- for semester I)

For the further course codes, addition to the programme code should be done as per the following instructions.

6. To represent core courses (CC) 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 Skill enhancement courses code (SE) followed by digits (1/2/3) followed by letters 'STP'-Sports training programme, 'BCE'-Basic communication in English, 'ICH'-Indian cultural heritage, followed by digits (1/2/3) representing the levels used. In case of subject related SEC, (SE) followed by digits (1/2/3) followed by a three lettered code representing the title of the course are used.
9. For Discipline specific elective course (DS) of Semester V and VI, (DS) followed by digits (1/2/3/4) followed by a three lettered code representing the title of the course are used.
10. 'P' followed by digit indicates practical course number (practical course number will be added for semesters only where there are more than one course).