SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

THREE-YEAR UNDERGRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

Subject: GEOLOGY

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-2027
Under Uniform NEP 2020)

SYLLABUS

Semester I and II

Semester III and IV

Semester V and VI

Credit Distribution

Three/Four-year UG Degree Programme (Level 4.5 to 5.5)

Vertical	Vertical Type	I	II		III	IV	V	VI	Total Credits	Grand Total
	(i) Three-year UG Degree Programme (Level 4.5.to 5.5)									
A	**Major**	4	4	Major	6	8	8	8	38	**48**
	DSC (60–64)			IKS	2				2	
	(Minimum 50% of Total Credits)	0	0	Elective	0	0	4	4	8	
B	**Minor (from same faculty of DSC) (18–24)**	4	4		4	4	4	4	24	**24**
C	**Generic/Open Elective (OE)** (Faculty-wise basket other than Major/Minor faculty) (10–12)	4	4		2	2	0	0	12	**12**
D(i)	**Vocational Skill Courses (VSEC)** corresponding to Major/Minor (8–10)	0	2		2	2	2	2	10	**16**
D(ii)	**Skill Enhancement Courses (SEC)**	2	2		0	0	2	0	6	
E(i)	**Ability Enhancement Courses (AEC)** (English + Modern Indian Language)	1+1	1+1		1+1	1+1	0	0	8	**14**
E(ii)	**Indian Knowledge System (IKS) 2 Generic**	2	0		0	0	0	0	2	
E(iii)	**Value Education Courses (VEC)** (Understanding India, EVS, Digital & Technological Solution) 4	2	2		0	0	0	0	4	
F(i)	**Internship / Apprenticeship** corresponding to Major 8 **(OJT)**	0	0		0	0	0	4	4	**18**
F(ii)	**Field Projects / Community Engagement & Service (CEP)** corresponding to Major 4-6	0	0		2	2	2	0	6	
F(iii)	**Co-curricular Courses (CC)** (health & wellness, yoga education, sports, fitness, cultural activities, NSS/ NCC & Fine/ Applied/ Visual/ Performing Arts **8**	2	2		2	2	0	0	8	
	Total Credits per Semester	**22**	**22**		**22**	**22**	**22**	**22**	**132**	**132**

(ii) Four-year UG Degree programme (Level 6.0) Honors Degree in Major or Minor A. Honors Degree in Major or Minor					
	Vertical Type			Semester VII	Semester VIII	
	Major (Offered at Three-year UG Programme)	**Mandatory**		**12-14(2*4+2*2 or 3*4+2)**	**12-14(2*4+2*2 or 3*4+2)**	**28**
		Elective		4	4	8
	Research Methodology (RM)			4	0	8
	On the Job Training (OJT)			0	4	4
	Total			**22**	**22**	**44**
	Cumulative			**(132+44) 176**		
(ii) Four-year UG Degree Programme (Level 6.0) B. Honors with Research Degree in Major or Minor					
	Major (Offered at Three-year UG Programme)			**Semester VII**	**Semester VIII**	
		Mandatory		8-10 (*24+2 or 24*)	8-10 (*24+2 or 24*)	20
		Elective		4	4	8
	Research Methodology (RM)			4	0	4
	Research Project (RP)			4	8	12
	Total			**22**	**22**	**44**
	Cumulative			**(132+44) 176**		

Sant Gadge Baba Amravati University, Amravati

Teaching and Learning Scheme for the Degree of Bachelor of Science

FACULTY: SCIENCE AND TECHNOLOGY

TLE Scheme for FIRST YEAR: SEMESTER – I (Geology) (Level 4.5)

(As per uniform NEP Scheme)

The Vertical	Type of Course	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Pract (Total)	
						External		Internal			
						Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major / Minor	Theory	119201	General Geology and Minerology	2	2	30	9	20	6	50	20
	Lab/Practical	119202	Minerology	2	4	25	10	25	10	50	20
Minor / Major	Theory	-	-	2	2	30	9	20	6	50	20
	Lab/Practical	-	-	2	4	25	10	25	10	50	20
GOEC	Theory	119203	Introduction to Geology	2	2	30	9	20	6	50	20
GOEC	Theory	119204	Physical Geology	2	2	30	9	20	6	50	20
VSC	-	-	-	-	-	-	-	50	20	50	20
SEC	Lab/Practical	119205	Mineral identification and Planet Earth	2	4	-	-	50	20	50	20
AEC - English	Theory		Refer University basket	1	1						
AEC –MIL	Theory		Refer University basket	1	1						
IKS-Generic	Theory		Refer University basket	2	2						
VEC	Theory		Refer University basket	2	2						
CC	Outdoor		Separate SOP will be released	2	4						
TOTAL				**22**	**30**						

TLE Scheme for FIRST YEAR: SEMESTER – II (Level 4.5)

The Vertical	Type of the Course	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Pract (Total)	
						External		Internal			
						Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major / Minor	Theory	119206	Geodynamics, Optical Minerology and Crystallography	2	2	30	9	20	6	50	20
	Lab/Practical	119207	Optical Minerology and Crystallography	2	4	30	9	20	6	50	20
Major / Minor	Theory		-	2	2	25	10	25	10	50	20
	Lab/Practical		-	2	4	30	9	20	6	50	20
GOEC	Theory	119208	Rivers of India	2	2	25	10	25	10	50	20
GOEC	Theory	119209	Mountains of India	2	2	30	9	20	6	50	20
VSC	Lab/Practical	119210	Geological Mapping	2	4	-	-	50	20	50	20
SEC	Lab/Practical	119211	Geological structure	2	4	-	-	50	20	50	20
AEC - English			Refer University basket	1	1	-	-	50	20	50	20
AEC –MIL			Refer University basket	1	1	-	-	50	20	50	20
VEC			Refer University basket	2	2						
CC			Separate SOP will be released	2	4						
TOTAL				**22**	**32**						

*** Important:**

- VSC Should be Complementary to Major/Minor
- SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

TLE Scheme for SECOND YEAR: SEMESTER – III (Level 5.0)

The Vertical	Type of the Course	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Pract (Total)	
						External		Internal			
						Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major	Major-T	119212	Igneous Petrology	2	2	30	9	20	6	50	20
Major	Major-T	119213	Economic Ore Geology	2	2	30	9	20	6	50	20
Major	Major-P	119214	Igneous and Economic ore Geology	2	2	30	9	20	6	50	20
Major	IKS-T	119215	Geoheritage	2	2	30	9	20	6	50	20
Minor	Minor-T	119216	Geomorphology and Hydrology	2	2	30	9	20	6	50	20
Minor	Minor-P	119217	Geomorphology and Hydrology	2	4	25	10	25	10	50	20
GOEC	GOEC-T	119218	Environmental geology	2	2	30	9	20	6	50	20
VSC	VSC-P	119219	Rainwater harvesting	2	4	-	-	50	20	50	20
FP/CES	FP/CES	119220	Geology project	2	4	-	-	50	20	50	20
CC	CC		Separate SOP shall be consulted from university website	2	4	-	-	50	20	50	20

Important: * VSC Should be Complementary to Major ** SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

TLE Scheme for SECOND YEAR: SEMESTER – IV (Level 5.0)

The Vertical	Type of the Course	Course Code	Course Title	Credits	Workload	Theory/Practical				Theory/Pract (Total)	
						External		Internal			
						Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
Major	Major-T	119221	Sedimentology and Metamorphic Petrology	2	2	30	9	20	6	50	20
Major	Major-T	119222	Geophysics	2	2	30	9	20	6	50	20
Major	Major-T*	119223	Stratigraphy	2	2	30	9	20	6	50	20
Major	Major-P	119224	Sedimentary, Metamorphic, and Geophysics	2	4	25	10	25	10	50	20
Minor	Minor-T	119225	Petrology	2	2	30	9	20	6	50	20
Minor	Minor-P	119226	Petrology	2	4	25	10	25	10	50	20
GOEC	GOEC-T	119227	Disaster management	2	2	30	9	20	6	50	20
VSC	VSC-P	119228	Watershed management	2	4	-	-	50	20	50	20
SEC	SEC-P#	-	-	2	4	-	-	50	20	50	20
FP/CES	FP/CES	**119230**	**Geology Project**	2	4	-	-	50	20	50	20
CC	CC		Separate SOP shall be consulted from university website	2	4	-	-	50	20	50	20

* To be implemented w.e.f. academic session 2026-27 # - Only applicable up to academic session 2025-26

Important: VSC Should be Complementary to Major and SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

TLE Scheme for THIRD YEAR: SEMESTER – V (Level 5.5)

The Vertical	Type of the Course	Course Code	Course Title	Credits	Workload	Theory/Practical Marks				Theory/Pract (Total) Marks	
						External		Internal			
						Max.	Min.	Max.	Min.	Max.	Min.
Major	Major-T	119230	Structural and Tectonics Geology	2	2	30	9	20	6	50	20
Major	Major-T	119231	Engineering Geology	2	2	30	9	20	6	50	20
Major	Major-T	119232	Geomorphology	2	2	30	9	20	6	50	20
Major	Major-P	119233	Structural, Tectonics Geology and Geomorphology	2	4	25	10	25	10	50	20
Major	Major-Elective T1	119234	Paleontology	2	2	30	9	20	6	50	20
Major	Major-Elective P1	119235	Paleontology	2	4	25	10	25	10	50	20
OR											
Major	Major-Elective T2	119236	Environmental Geology	2	2	30	9	20	6	50	20
Major	Major-Elective P2	119237	Environmental Geology	2	4	25	10	25	10	50	20
Minor	Minor-T	119238	Indian Stratigraphy and Paleontology	2	2	30	9	20	6	50	20
Minor	Minor-P	119239	Indian Stratigraphy and Paleontology	2	4	25	10	25	10	50	20
VSC	VSC-P	119240	Gemology	2	4	-	-	50	20	50	20
SEC	SEC	119241	Tools and Techniques in Geology	2	4	-	-	50	20	50	20
FP/CEP	FP/CEP	119242	Project	2	4	-	-	50	20	50	20
Non Credit	Non Credit		Foundation of Artificial Intelligence	NC	2			30+20	9+6	50	20

Important:

- **VSC Should be Complementary to Major**
- **SEC must be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor**
- As per Sant Gadge Baba Amravati University, Amravati Extra-Ordinary Notification No. No. 241/2025 Dated 24/12/2025 "Foundation of Artificial Intelligence" is the Mandatory **Non-Credit Course** compulsory course for all the UG students in fifth semester of all undergraduate programs of all faculties in Sant Gadge Baba Amravati University, Amravati to earn their degree
- NC is Non-Credit Course
- Students must select **Any One** of the Major-Elective Courses (T1 to T2) with respective Practical Course in Semester V and **same shall be continued** for Semester VI
- Students must select **Any One** of the SEC-P (P1 to P4) Course in Semester V and Semester VI

TLE Scheme for THIRD YEAR: SEMESTER – VI (Level 5.5)

The	Type of the Course	Course Code	Course Title	Credits	Workload	Theory/Practical Marks		Theory/Pract (Total) Marks
						External	Internal	

Vertical						Max.	Min.	Max.	Min.	Max.	Min.
Major	Major-T	119243	Remote Sensing and GIS	2	2	30	9	20	6	50	20
Major	Major-T	119244	Hydrogeology	2	2	30	9	20	6	50	20
Major	Major-T	119245	Mining Geology	2	2	30	9	20	6	50	20
Major	Major-P	119246	Hydrology and Remote Sensing and GIS	2	4	25	10	25	10	50	20
Major	Major-Elective T1	119247	Petroleum and Coal Geology	2	2	30	9	20	6	50	20
Major	Major-Elective P1	119248	Petroleum and Coal Geology	2	4	25	10	25	10	50	20
OR											
Major	Major-Elective T2	119249	Exploration Geology	2	2	30	9	20	6	50	20
Major	Major-Elective P2	119250	Exploration Geology	2	4	25	10	25	10	50	20
OR											
Major	Major-Elective T3	119251	Micropaleontology and field geology	2	2	30	9	20	6	50	20
Major	Major-Elective P3	119252	Micropaleontology and field geology	2	4	25	10	25	10	50	20
Minor	Minor-T	119253	Structural and Tectonics	2	2	30	9	20	6	50	20
Minor	Minor-P	119254	Structural and Tectonics	2	2	30	9	20	6	50	20
VSC	VSC-P	119255	Environmental Geology	2	4	-	-	50	20	50	20
CC	Intern/Apprenticeship	-	Geology (Internship / Apprenticeship)	4	8	-	-	50	20	50	20

Important: VSC Should be Complementary to Major and SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

SWAYAM/NPTEL Courses under NEP 2020

Sr. No.	Semester	Course Title	Course Code*	Credits**	Institution	Agency	Enrollment Ends	Link to Enroll
1	I	The Evolution of the Earth and Life	noc25_ce59	3	IIT Madras	NPTEL	26 January 2026	Enroll on SWAYAM-NPTEL https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ce59
2	II	Geology and Soil Mechanics	noc26_ce29	3	IIT Kanpur	NPTEL	26 January 2026	Enroll on NPTEL https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ce29
3	III	Geology: Petrology	cec26_ge12	4	DHSGSU Sagar	CEC / SWAYAM	31 August 2026	Enroll on SWAYAM
4	IV	Geology: Metamorphic Petrology and Thermodynamics	cec26_ge15	4	DHSGSU Sagar	CEC / SWAYAM	31 August 2026	Enroll on SWAYAM
5	V	Introductory Field Structural Geology	noc25_ce96	1	IIT Kanpur	NPTEL	27 July 2026	Enroll on SWAYAM-NPTEL https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_ce96
6		Structural Geology	noc26_ce19	3	IIT Kanpur	NPTEL	27 July 2026	Enroll on NPTEL https://nptel.ac.in/courses/105104191
7	VI	Earth Sciences for Civil Engineering (Hindi)	noc25_ce48	2	IIT Kanpur	NPTEL	27 July 2026	Enroll on NPTEL https://nptel.ac.in/courses/105104224
8		Environmental Geosciences	noc26_ce37	3	IIT Kharagpur	NPTEL	26 January 2026	Enroll on NPTEL https://nptel.ac.in/courses/120105559

***** **Course codes may vary according to the year and session of enrollment**

****** **Credits will be awarded as per provisions of the SWAYAM/NPTEL at the time of actual enrollment.**

Instructions for Enrollment in SWAYAM/NPTEL Courses under NEP 2020

All students of **B.Sc. with Geology as Major or Minor** of all semesters are encouraged to enroll in suitable SWAYAM/NPTEL online courses to enhance their academic knowledge, practical skills, and employability.

General Instructions

1. Students may choose any course of their interest listed in table above for specific semester.
2. Before enrollment, students must ensure that they have an active Academic Bank of Credits (ABC) ID. The same ABC ID should be used while registering for the selected SWAYAM/NPTEL course so that earned credits can be deposited in the Academic Bank of Credits.
3. Students should carefully read the course details including duration, eligibility, syllabus, examination schedule, and credit structure before enrolling.
4. Merely enrolling in a course does not make a student eligible for academic credits. Students must:
   Complete the course requirements, appear for the proctored examination, and successfully pass the examination as per the norms prescribed by SWAYAM/NPTEL.
5. Credits will be awarded only after successful completion and certification of the course by the concerned agency.
6. Every student must submit the details of the enrolled course to the Department of Geology immediately after registration.
7. Submission of enrollment details to the Department is mandatory to facilitate record maintenance and compliance with university requirements regarding credit transfer and academic documentation.
8. Students are advised to preserve all course-related documents, including Enrollment confirmation, Course progress records, Examination registration receipt, Score card, Final certificate.
9. Students shall be responsible for timely registration for the examination, payment of examination fees (if applicable), and completion of all course requirements within the stipulated period.
10. The Department of shall not be responsible for missed deadlines, incomplete registrations, examination non-appearance, or failure to satisfy the certification requirements of the concerned SWAYAM/NPTEL course.
11. After successful completion of the course, students must submit a copy of the course certificate and score card to the Department of Geology for further processing and reporting to the University.

Notes:

a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.

b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).

c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.

d. Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.

e. Value Education Courses to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.

f. Generic / Open Elective Courses (GE/OE): Courses to be selected from the Basket of Courses provided by the University

g. Abbreviations: Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under

i. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
   • First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
   • Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
   • Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.
ii. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.
iii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations
iv. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

Conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.
The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination

1. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. **However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination**. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
2. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
3. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
4. Provided that the student shall be eligible to appear for examination if - a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time. b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University. c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
5. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
6. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
Teaching and Learning Scheme: for the Degree of Bachelor of Geology
(Three Years- Six Semesters Bachelor's Degree Programme)

FIRST YEAR: SEMESTER – I

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major/ Minor	Theory1	119201	General Geology and Minerology	2	2	6
			Lab/Practical-1	119202	Minerology	2	4	
	b.	Minor / Major	Theory1	-	-	-	2	6
			Lab/Practical-2	-	-	-	4	
	c.	Generic/ Open Elective	Theory1	119203	Introduction to Geology	2	2	4
			Theory2	119204	Physical Geology	2	2	
	d.	VSC	-	-	-	-	-	4
		SEC	Lab/Practical-3	119205	Mineral identification and Planet Earth	2	4	
	e.	AEC - English	Theory			1	1	6
		AEC – MIL	Theory			1	1	
		IKS- Generic	Theory			2	2	
		VEC	Theory			2	2	
	f.	CC	Outdoor			2	4	4
		TOTAL				**22**	**30**	**30**

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Major/Minor Theory - General Geology and Minerology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	1	119201	General Geology and Minerology	2	30	2 Hrs	30

Course Objectives:	• **Familiarized with minerals and their properties.** • **Developed skill in identification of minerals.**			
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about geology, branches, scope and origin of the earth system. 2. Explain the age determination methods and composition & constitution of earth. 3. Students will be able to identify the physical properties minerals			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Definition of geology, branches and scope. Earth in the solar system Origin of the earth: Nebular, Planetesimal and Tidal hypothesis,	8 Hrs	8 Marks	
Unit II	Age of earth: relative and radioactive methodsof age determination – U/Pb, Rb/Sr, K/Ar and Carbon-14 method. constitution of earth: crust, Mantle and Core. Lithosphere, Hydrosphere, Atmosphere and Biosphere.	7 Hrs	7 Marks	
Unit III	Definition of mineral, rock forming & ore minerals, Physical properties of minerals Determination of specific gravity by Walker's steelyard & Jolly's Spring balance.	8 Hrs	8 Marks	
Unit IV	Structure of Silicates minerals, Physical and chemical properties Feldspar, Quartz family, Mica, Pyroxene, Amphibole, Olivine minerals groups	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. 3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. 4. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi. 5. Physical Geology: Datta A.K., Kalyani Pub. 6. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India) 7. Rutley's Elements of Mineralogy: H.F.Read 8. A Text Book of Mineralogy: Dana, E.S. and Ford, W.E.(1949) Wiley Eastern Ltd. **Reference Books:** 1. Concepts in Geology: Chakranaryan, Kulkarni, Scientific Publication, Pune. 2. Fundamentals of Mineralogy and Petrology: M. A. Koregave, Pub.Book World Enterpress- Bombay. 3. Principal of Physical Geology: Arthur Holmes 1992, Chapmen and Hall, London 4. Dynamic Earth: Skinner Potter - Pub.John, Wiley. 5. Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub.Book World Enterpress- Bombay. 6. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical – I: Minerology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	1	119202	**Minerology**	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **Familiarized with minerals and their properties.** • **Developed skill in identification of minerals.**
Course Outcomes:	**After completing the course, the student will** 1. Students will be able to identify the optical properties of mineral

Contents	Workload Allotted	Credit	Incorporation of Pedagogies
Megascopic identification of common minerals – Quartz and its verities, Microcline/ Orthoclase, Albite, Apatite, Dolomite, Graphite, Natrolite, Stilbite Chlorite, Augite, Garnet Topaz, Labrodorite, Hypersthene, Tremolite, Biotite, Muscovite, Calcite, Hornblende, Kyanite, Talc, Dolomite, Olivine, Tourmaline, Corundum, Gypsum, Hematite, Chromite, Chalcopyrite, Asbestos, Barite, Fluorite, Chlorite and magnesite	**4 Hrs per week**	**2**	
Toposheets: reading of toposheet with reference to toposheet number, latitude, longitude, state, district,scale, adjacent toposheet numbers and conventional signs.			

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I.	Megascopic identification of Minerals (10 samples)	15 marks
II.	Toposheet reading and interpretation	05 marks
III.	Record	03 marks
IV.	Viva-voce	02 marks
	Total –	25 marks

GOEC Theory: Introduction to Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	1	119203	Introduction to Geology	2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• **Familiarized with the important branches of geology and its importance.** • **Learn the use of polarizing microscope**
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about geology, branches, scope and origin of the earth system. 2. Explain the age determination methods and composition & constitution of earth. 3. Understand the rock weathering process.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Definition of Geology, branches and scope Geology. Relations to other sciences,	8 Hrs	8 Marks	
Unit II	Earth as a member of solar system and gross feature of the of earth	7 Hrs	7 Marks	
Unit III	Lithosphere, hydrosphere, atmosphere and biosphere.	8 Hrs	8 Marks	
Unit IV	Weathering and its types	7 Hrs	7 Marks	

References:

Text books:

1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.
2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.
4. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi.
5. Physical Geology: Datta A.K., Kalyani Pub.
6. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)

Reference Books:

1. Dynamic Earth: Skinner Potter: Pub. John, Wiley.
2. Fundamentals of Geology: Vol. I, II, Borges, Gwalani et al., Himalaya Pub., Bombay.
3. Concepts in Geology: Chakranaryan, Kulkarni, Scientific Publication, Pune.

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	4. Principal of Physical Geology: Arthur Holmes 1992, Chapmen and Hall, London Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

GOEC Theory: Physical geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	1	119204	**Physical geology**	2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• **To understand the structure, composition, and dynamic processes of the Earth and the geological agents shaping the surface.** • **To study geological phenomena such as earthquakes, volcanoes, rivers, glaciers, wind, and groundwater in relation to landform development and natural resources.**
Course Outcomes:	**After completing the course, the student will** 1. Describe and interpret the development of landform geologic structures made by the various agents like river, wind, glacier etc.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Geological work done by wind	8 Hrs	8 Marks	
Unit II	Geological work done by Rivers	7 Hrs	7 Marks	
Unit III	Geological work done by underground water	8 Hrs	8 Marks	
Unit IV	Geological work done by Glaciers	7 Hrs	7 Marks	

References:

1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.
2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.
4. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi.
5. Physical Geology: Datta A.K., Kalyani Pub.

Reference Books:

1. Dynamic Earth: Skinner Potter: Pub. John, Wiley.
2. Fundamentals of Geology: Vol. I, II, Borges, Gwalani et al., Himalaya Pub., Bombay.
3. Concepts in Geology: Chakranaryan, Kulkarni, Scientific Publication, Pune.
4. Principal of Physical Geology: Arthur Holmes 1992, Chapmen and Hall, London

Weblink to Equivalent MOOC on SWAYAM if relevant:
Weblink to Equivalent Virtual Lab if relevant:

Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Skill Enhancement Course - Mineral identification and Planet Earth

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	1	119205	Mineral identification and Planet Earth	2	60	3 Hrs	50

Course Objectives:	• To understand the origin, structure, composition, and evolution of Planet Earth along with the properties and classification of minerals. • To develop knowledge and practical skills in mineral identification and to study Earth processes, natural resources, and environmental interactions shaping the planet.
Course Outcomes:	**After completing the course, the student will**

Unit System	Contents	Workload Allotted	Credit	Marks and exam duration
Unit 1	Megascopic minerals – Quartz, Microcline/ Orthoclase, Albite, Apatite, Dolomite, Graphite	**2 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20**
Unit 2	Natrolite, Stilbite Chlorite, Augite, Garnet, Topaz, Labrodorite,			

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Unit 3	Hypersthene, Tremolite, Biotite, Muscovite, Calcite, Hornblende, Kyanite, Talc, Dolomite, Olivine, Tourmaline, Corundum Gypsum, Hematite, Chromite, Chalcopyrite, Asbestos, Barite, Fluorite, Chlorite and magnesite.			**Exam Duration 3 Hrs**
Unit 4	Earth in the solar system Origin of the earth: Nebular, Planetesimal and Tidal hypothesis, Age of earth: relative and radioactive methods of age determination – U/Pb, Rb/Sr, K/Ar and Carbon-14 method. Constitution of earth: crust, mantle and core. Lithosphere, hydrosphere, atmosphere and biosphere.			
Practical Megascopic Identification of common minerals – Quartz, Microcline/ Orthoclase, Albite, Apatite, Dolomite, Graphite, Natrolite, Stilbite Chlorite, Augite, Garnet, Topaz, Labrodorite, Hypersthene, Tremolite, Biotite, Muscovite, Calcite, Hornblende, Kyanite, Talc, Dolomite, Olivine, Tourmaline, Corundum, Gypsum, Hematite, Chromite, Chalcopyrite, Asbestos, Barite, Fluorite, Chlorite and magnesite Study of elements of Symmetry in the crystals of normal seven classes. Study and reading of wooden crystallography models belonging Normal class of seven major crystal systems.				
Practical Internal Activity 1. Perform any 20 Mineral samples 2. Field work 3. Internal Viva				
References:	1. Rutley's Elements of Mineralogy: H.F.Read 2. A Text Book of Mineralogy: Dana, E.S. and Ford, W.E.(1949) Wiley Eastern Ltd.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

FIRST YEAR: SEMESTER – II

Mode of Teaching	Ver. No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical) / Outdoor / Field	a.	Major/ Minor	Theory2	119206	Geodynamics, Optical Minerology and Crystallography	2	2	6
			Lab/Practical 4	119207	Optical Minerology and Crystallography	2	4	
	b.	Minor/ Major	Theory2	-	-	2	2	6
			Lab/Practical-5	-	-	2	4	
	c.	Generic/ Open Elective	Theory3	119208	Rivers of India	2	2	4
			Theory4	119209	Mountains of India	2	2	
	d.	VSC	Lab/Practical-6	119210	Geological Mapping	2	4	8
		SEC	Lab/Practical-7	119211	Geological structure	2	4	
	e.	AEC - English	Theory			1	1	4
		AEC – MIL	Theory			1	1	
		VEC	Theory			2	2	
	f.	CC	Outdoor			2	4	4
		TOTAL				**22**	**32**	**32**

Major/Minor Theory – Geodynamics, Optical Minerology and Crystallography

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119206	Geodynamics, Optical Minerology and Crystallography	2	30	2 Hrs	30

Course Objectives:	• **Understand Earth's Dynamic Processes** • **Develop Skills in Mineral Identification** • **Apply Geological Concepts Practically**
Course Outcomes:	**After completing the course, the student will** **1.** Describe and interpret the development of landform geologic structures made by the various agents like river, wind, glacier etc. **2.** Understand and explain the volcanism and earth quakes theory **3.** Define mineral and Describe Optical properties of the minerals **4.** Explain the crystal and its characters and different Crystal system.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Rock weathering – physical weathering, chemical weathering and biological weathering. Geological work done by wind, Rivers, underground water and Glaciers.	8 Hrs	8 Marks	
Unit II	Volcanism: Structure of volcano, products of volcanoes. Types of volcanic eruption, Causes and distribution of volcanoes. Earthquakes: definition, terminology, Elastic rebound theory – causes, effects, magnitude and intensity; Seismogram and Seismograph.	7 Hrs	7 Marks	
Unit III	Nature of light, Ordinary and plane polarized light; Reflection and refraction, total internal reflection and critical angle; Double refraction - Nicol prism, Becke line effect. Properties of minerals under ordinary and plane polarized light and between cross nicol	8 Hrs	8 Marks	

Unit IV	Elementary idea about crystal structure: crystal, forms, faces, edges, solid angle and interfacial angle and its measurement. Laws of crystallography Crystal symmetry: planes, axes, centre, crystallographic axes. Miller's indices and Weiss Parameters. Classification of crystal in to seven systems with their symmetry elements of normal classes; Cubic, Orthorhombic, Tetragonal, Hexagonal, Monoclinic and Triclinic.	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. 3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. 4. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi. 5. Physical Geology: Datta A.K., Kalyani Pub. 6. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India) 7. Rutley's Elements of Mineralogy: H.F.Read 8. A Text Book of Mineralogy: Dana, E.S. and Ford, W.E.(1949) Wiley Eastern Ltd. 9. Optical Mineralogy: Roger and Kerr: **Reference Books:** 1. Concepts in Geology: Chakranaryan, Kulkarni, Scientific Publication, Pune. 2. Fundamentals of Mineralogy and Petrology: M. A. Koregave, Pub.Book World Enterpress-Bombay. 3. Principal of Physical Geology: Arthur Holmes 1992, Chapmen and Hall, London 4. Dynamic Earth: Skinner Potter - Pub.John, Wiley. 5. Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub.Book World Enterpress-Bombay. 6. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India. 7. Optical Mineralogy; Winchell 8. A study of rock in thin section: W. W. Moorhouse, Harper and sons Publication Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab/Practical 4: Optical Minerology and Crystallography

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119207	Optical Minerology and Crystallography	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	**To develop practical and analytical skills in crystallography, optical mineralogy for the identification and interpretation of minerals.**			
Course Outcomes:	**After completing the course, the student will** Students will be able to identify the optical properties of mineral Identify the crystal models on the basis of its crystal axis, elements of symmetry and forms of crystal.			
Unit System	**Contents**	**Workload Allotted**	**Credit**	
	Microscopic identification of common minerals: Quartz, Hornblende, Muscovite, Biotite, Garnet, Calcite, Orthoclase, Microcline, Plagioclase, Augite, Olivine, Hypersthene, Tourmaline, Chlorite, Epidote	**4 Hrs**	**2**	
	Study of elements of Symmetry in the crystals of normal seven classes. Study and reading of wooden crystallography models belonging Normal class of seven major crystal systems.			

	Practical Examination will be of 3 hours duration and Carry 25 Marks. The Distribution of marks for Practical will be as follows. i) Microscopic identification of Minerals (06 slides) 12 marks ii) Symmetry of elements of crystals 08 marks iii) Record 03 marks iv) Viva-voce 02 marks Total – 25 marks

GOEC Theory: Rivers of India

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119208	Rivers of India	2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• **Understand River Systems and Drainage Patterns** • **Analyze Fluvial Processes and Landforms** • **Evaluate Socio-Economic and Environmental Importance**			
Course Outcomes:	**After completing the course, the student will** be able to understand the geomorphology and topography of rivers. Learn the Role of river in formation of land form. Learn the different rivers and tributaries of India			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Introduction to geomorphology and topography, Weathering; erosion, soil formation, valleys and mounds	8 Hrs	8 Marks	
Unit II	The dynamics of erosional and depositional landforms resulting from the action of rivers, roles of alluvium, meander, delta and sand bars.	7 Hrs	7 Marks	
Unit III	Major rivers of India-Indus, Ganga, Brahmaputra, Mahanadi, Narmada, Tapi, Godavari, Krishna, Kaveri and their tributaries	8 Hrs	8 Marks	
Unit IV	Rivers of Maharashtra and their tributaries. Major Dams/reservoir on rivers.	7 Hrs	7 Marks	
References:	1. A Geography & General Geology: Parbin Singh 2. A Textbook of Oceanography: Parbin Singh 3. Rivers of India: Sunil Vidhyanathan 4. A Textbook of Geology: Dr. U.D. Kulkarni and Dr. I.A.Khan			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

GOEC Theory: Mountains of India

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119209	Mountains of India	2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• **To understand the origin, structure, distribution, and geological significance of the major mountain systems of India.** • **To study the physiography, tectonic evolution, natural resources, and environmental importance of Indian mountain regions.**			
Course Outcomes:	**After completing the course, the student will** be able to understand the geomorphology and topography of Mountain. Learn the genetic formation of Mountains in India. Learn the different Mountains of India.			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	The dynamics of erosional and depositional landforms resulting from the action of Wind	8 Hrs	8 Marks	
Unit II	The dynamics of erosional and depositional landforms resulting from the action of Glacier	7 Hrs	7 Marks	

Unit III	Major Mountains of India-Himalaya, Aravali, Vindhyans. Satpura, Western Ghats, Eastern Ghats,	8 Hrs	8 Marks	
Unit IV	Sahyadri, Satmala and Ajanta ranges of Maharashtra	7 Hrs	7 Marks	
References:	1. A Geography & General Geology: Parbin Singh 2. Geology of India & Burma: M.S. Krishnan 3. A Textbook of Geology: Dr. U.D. Kulkarni and Dr. I.A.Khan. 4. Mountains of India : M.S.Kolh			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Vocational Skill Course: Geological Mapping

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119210	Geological Mapping	2	60	3 Hrs	50

Course Objectives:	• **Understand Principles of Geological Mapping** • **Develop Field Mapping Skills** • **Interpret Geological Structures and History**			
Course Outcomes:	**After completing the course, the student will** Learn the Reading of Topographic map be able to identify the mineral in field			
Unit System	**Contents**	**Workload Allotted**	**Credit**	**Marks and exam duration**
	Geological mapping Primary and secondary structures Dip and strike, Trend, plunge Mineral identification in Field	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**
Activity 1. Perform any 5 experiment/model/ Map 2. Field work 3. Internal Viva				
References:	1. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Skill Enhancement Course: Geological Structure

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	2	119211	Geological structure	2	60	3 Hrs	50

Course Objectives:	• **Understand Structural Elements** • **Analyze Deformation Processes** • **Develop Structural Interpretation Skills**			
Course Outcomes:	**After completing the course, the student will** Learn about the structure occurs in geology like outcrop Also know about the unconformity, joint			
Unit System	**Contents**	**Workload Allotted**	**Credit**	**Marks and exam duration**
	Identification of Sedimentary structures and Metamorphic structures. Batholiths, Phaccoliths, lopoliths, laccoliths, sill, dykes, conolith, mass lava flows, fissure volcanic cone crater, columnar, mesa and buttes, eruption, ropy, pillow, outcrop, outlier and inliers, Unconformity, definition and types of unconformities Joints, definition, type of joints and general characteristic of joints.	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**
Practical Internal **Activity** 1. Perform any 5 experiment/model/ Map/Structural Map 2. Field work 3. Internal Viva				

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

References:	1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Notes:

a. # Here mention the title of Degree. For example - Degree of Bachelor of Science with the Major Discipline / Subject Botany as Degree of Bachelor of Science (Botany)

b. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. However, for Music Discipline the batch size shall be of 7 students. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.

c. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).

d. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.

e. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI**.** These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.

f. Value Education Courses to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.

g. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University

h. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory : Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination and Assessment Process:

i. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.

ii. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.

iii. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination. Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in Teaching Learning Scheme prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table

Table: Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertica	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
a	Maor	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	--	--	--	--	--	--
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External &	30	9	20	6	50	20	--	--	--	--	--	--

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

		Internal												
f	Internship/ Apprentices hip	Internal	Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process shall be prescribed separately											
	FP/CEP													
	CC													

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under

v. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
- First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
- Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
- Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.

vi. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.

vii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations

viii. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

Conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.
The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination

7. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. **However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination**. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
8. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
9. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
10. Provided that the student shall be eligible to appear for examination if - a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time. b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University. c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
11. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
12. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

Curriculum Design:

Each theory paper of Major shall be of 2 Credits comprising of 4 Units with Teaching Hours as mentioned in the table. The pattern of theory papers shall be as per following template –

The Curriculum of any Course shall be designed as per following template:

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into the Teaching, Learning, and Evaluation (T, L, & E) Processes.
Unit II	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Unit III	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit IV	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

THREE-YEAR UNDERGRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

Subject: GEOLOGY

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-2027
Under Uniform NEP 2020)

SYLLABUS

Semester III and IV

Sant Gadge Baba Amravati University, Amravati
FACULTY: Science and Technology
Teaching and Learning Scheme: for the Degree of Bachelor of Geology
(Three Years- Six Semesters Bachelor's Degree Programme)

SECONOD YEAR: SEMESTER – III

Mode of Teaching	Ver. No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major	Theory3	119212	Igneous Petrology	2	2	10
			Theory4	119213	Economic Ore Geology	2	2	
			Lab/Practical-8	119214	Igneous and Economic ore Geology	2	4	
		IKS - SS	Theory	119215	Geoheritage	2	2	
	b.	Minor	Theory3	119216	Geomorphology and Hydrology	2	2	6
			Lab/Practical-9	119217	Geomorphology and Hydrology	2	4	
	c.	Generic/ Open Elective	Theory5	119218	Environmental geology	2	2	2
	d.	VSC	Lab/Practical-10	119219	Rainwater harvesting	2	4	4
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/CES	Project	119220		2	4	8
		CC	Outdoor			2	4	
		TOTAL				**22**	**32**	**32**

Major Theory – Igneous Petrology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119212	Igneous Petrology	2	30	2 Hrs	30

Course Objectives:	• **Understand basic concepts of petrology, petrography, rock cycle, and types of rocks.** • **Study the origin, composition, textures, and structures of igneous rocks and magmatic** • **processes.** • **Learn various classification systems of igneous rocks and Bowen's Reaction Series.** • **Explore phase diagrams and the distribution of igneous rocks in time and space.**
Course Outcomes:	**After completing the course, the student will** 1. Explain and describe the formation, classification, and structure of igneous rocks. 2. Students will be able to identify common sedimentary and metamorphic rocks

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Definition of petrology, petrography, petrogenesis. Concept of rock cycle. Types of Rocks. Igneous rocks: Magma and its composition, pyrogenetic minerals, formation of crystals and glass; intrusive – concordant and discordant forms of igneous rocks. Extrusive forms. Texture in Igneous rocks: definition, types and controlling factors- crystallinity, granularity, shape of crystals and mutual relations, equigranular (granitic), inequigranular (porphyritic), directive and intergrowth, glassy.	8 Hrs	8 Marks	
Unit II	Structure in Igneous Rocks: vesicular, amygdaloidal, blocky, pillow, flow and columnar joints; distinction between textures and structures. Evolution of Magma: Differentiation, Fractional Crystallization, Magmatic assimilation. Characteristics of acidic, alkaline and basic igneous rocks. Characters of some common igneous rocks and their Indian occurrences.	7 Hrs	7 Marks	
Unit III	Classification of Igneous rocks: IUGS Classification. Other aspects of classification – Plutonic, Hypabyssal and Volcanic, Chemical, Silica based, Silica saturation, CIPW, mineralogical, Colour Index and Tabular Classification. Bowens Reaction series.	8 Hrs	8 Marks	
Unit IV	Concept of phase Rule: system, phase, component. Degree of freedom. Equilibrium. One component system of augite and quartz, two (Binary) component system, Binary system with complete solid solution – plagioclase feldspar, mixed crystal, diopside- anorthite eutectic system, ternary system and their petrogenetic significance. Ternary system of diopside, albite and anorthite. Distribution of Igneous rocks in time and space.	7 Hrs	7 Marks	

References:

Text books:

1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.
2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.

Reference Books:

1. Dynamic Earth: Skinner Potter - Pub.John, Wiley.
2. Concepts in Geology: Chakranarya, Kulkarni, Pub.Scientific Publication, Pune. 101 102
3. Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub.Book World Enterpress- Bombay.
4. Principles of Petrology: G.W.Tyrell (1998) B.I.Publications Pvt.Ltd., New Delhi.

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	5. Geology of Maharashtra: Deshpande, G.G. (1998). Geological Society of India, Bangalore. 6. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India. 7. A study of rock in thin section: W. W. Moorhouse, Harper and sons Publication 8. Igneous and Metamorphic Petrology: Turner, F. J and Verhoogen, J, McGraw Hill Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Major Theory 4 – Economic Ore Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119213	Economic Ore Geology	2	30	2 Hrs	30

Course Objectives:	• **Understand the scope of economic geology and key concepts such as ores, minerals, gangue, tenor, and ore grade.** • **Study the processes and types of ore formation including magmatic, hydrothermal,** **sedimentary, metamorphic, and supergene deposits.** • **Learn the mineralogy, properties, uses, and distribution (geological and geographical) of important metallic and non-metallic mineral deposits in India.** • **Explore the origin, classification, and distribution of coal and petroleum deposits, including types of oil traps and migration processes.**			
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about Economics geology 2. Describe and interpret the various mineral deposits methods			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Economic geology: Introduction, purpose and scope; Metallic and non- metallic minerals, ore, ore deposits, gangue minerals, tenor and grade of the ore; Processes of ore formation, types of deposits, distribution of mineral deposits in space and time, metallogenic epochs and provinces, geological thermometers; Classifications of mineral deposits, magmatic concentration deposits, contact metasomatic deposits.	8 Hrs	8 Marks	
Unit II	Sedimentary deposits, hydrothermal deposits (cavity filling and replacement), evaporation deposits, colloidal deposits, residual and mechanical concentration deposits, oxidation and supergene sulphide enrichment deposits, metamorphic and metamorphosed deposits	7 Hrs	7 Marks	
Unit III	Mineralogy, properties, uses, origin, mode of occurrence, types of deposits, geological and geographical distribution in India of the metallic mineral deposits like gold, iron, copper, lead, zinc, manganese, aluminium and chromite.	8 Hrs	8 Marks	
Unit IV	Mineralogy, properties, uses, origin, mode of occurrence, types of deposits, geological and geographical distribution in India of non-metallic deposits like asbestos, mica, gypsum, barite, magnesite and limestone. Properties, classifications, origin, uses, geological and geographical distribution of coal deposits of India. Origin and migration of oil, oil trap and its types, geological and geographical distribution of Petroleum deposits of India.	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P. K. Mukerjee - World Press Pub., Calcutta. 3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. 4. Text Book of Physical Geology: G. B. Mahaptra- Pub. C.B.S., New Delhi.			

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	Reference Books: 1. McKinstry, H.E. (1972) Mining Geology. Prentice – Hall Inc. 2. Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH publishing Co., New Delhi. 3. Bagchi, T. C., Sen Gupta, D. K. and Rao, S.V.L.N. (1979) Elements of Prospecting. 4. Jensen, M.L. and Bateman, A.M. (1981) Economic Mineral Deposits. John Wiley and Sons, New York. 5. Deb, S. (1980) Industrial Minerals and Rocks of India. Allied Publishers, New Delhi. 6. Sen, A.K. and Guha, P.K. (1993) a handbook of Economic Geology. Dynamic printers, Kolkata. 7. Banerjee, D.K. (1992) Mineral resources of India. The World Press Pvt. Ltd., Kolkata. 8. Sharma, N.L. and Ram, K.S.V. (1964) Introduction to India's Economic minerals, Dhanbad Publishers. 9. Sinha and Sharma. Mineral Economics. 10. Krishnaswamy, S. (1979) India's Mineral Resources. Oxford IBH, Pub. Co. New Delhi. 11. Prasad Umeshwar. Economic deposits of India. CBS Publishers, New Delhi 12. Park, C. F. and Mac Diamid, R.A Ore Deposits. Freeman and company, Saint Francisco. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical – 8: Igneous and Economic ore Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119214	Igneous and Economic ore Geology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To develop practical skills in the identification and classification of igneous rocks and economic ore minerals based on their physical and mineralogical properties.** • **To understand the origin, occurrence, textures, structures, and economic significance of igneous rocks and ore deposits through laboratory studies and specimen analysis.**
Course Outcomes:	**After completing the course, the student will** 1. Students will be able to identify the megascopic and microscopic properties of Igneous rock 2. Identification of ore and industrial minerals

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Megascopic identification of common Igneous rock Microscopic identification of common Igneous rock	**4 Hrs per week**	**2**	
Identification of ore minerals by Physical properties (40 to 60 specimens) Identification of industrial Minerals by physical properties (20 to 30 specimens) Microscopic identification of ore minerals Microscopic of industrial Minerals Exercises showing major metallic and non-metallic minerals on India map (6 to 10 maps)			

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

V. Megascopic identification of Igneous rock (06 samples)	06 marks
VI. Microscopic identification of Igneous rock (02 slide)	04 marks
VII. Megascopic identification of ore and industrial minerals (04 samples)	04 marks
VIII. Microscopic identification of ore and industrial minerals (02 slide)	04 marks
IX. Exercises of metallic and non-metallic deposits of India on maps (1maps)	02 marks
X. Record	03 marks
XI. Viva-voce	02 marks
	Total – 25 marks

IKS Theory: Geoheritage

Level	Semester	Course Code	Course Name		Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119215	Geoheritage		2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• Students will explore the role of policy and planning in protecting Geoheritage • Students will learn to recognize and describe various geological formations, fossils, and landscapes that constitute geoheritage. • A key objective is to learn about effective conservation strategies for geoheritage sites.
Course Outcomes:	After completing the course, the student will 1. Understand the basic idea about geodiversity 2. Students will be able to Geoconservation legislations 3. Understand the Students learn about Geoheritage conservation

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Concepts of geodiversity, geosites, geoheritage, geoconservation, geotourism and geoparks. International geoconservation designations: World Heritage Sites, Ramsar Sites, European Designations (SPA, SAC, ASSI, NNR, AONB)	8 Hrs	8 Marks	
Unit II	Definition of geoparks • Objectives of geoparks, History of development of geoparks: role of UNESCO, international promotional events , Infrastructural elements of geoparks: geoguides and georangers, geopaths, georoutes, information panels and signages, geomuseums, geoshops, geohotels, International Geopark Networks: GGN, EGN, APGN, AGN	7 Hrs	7 Marks	
Unit III	Major Historical Earthquakes in India, Major Historical Volcanoes in India, Major floods in India, Indian history of cyclone, Historical River Course Changes.	8 Hrs	8 Marks	
Unit IV	Rock Art in Kumaon Himalaya, Rock-cut monuments in India, buddhist rock cut architecture. rock cut architecture in Ajanta Caves and Ellora Caves. Kailash Temple (Cave 16) Elephanta Caves (Mumbai), Bhaja and Karla Caves (Lonavala), Karla and Bhaja Caves: Lesser-Known Gems ,Other Sites, Artificial caves of Eastern India (3rd–2nd centuries BC), Artificial caves of Western India, First wave of construction (2nd century BC–4th century AD), Second wave of cave construction (5th–6th century AD), Final wave of cave construction (6th–15th century CE)	7 Hrs	7 Marks	

References: Text books and Reference

1. C. Anze, L. Yunting and C.Y. Ng. Young (2015). The Principles of Geotourism, Science Press, Beijing
2. C.V. Burek and C.D. Prosser (2008). The History of Geoconservation, The Geological Society, London, Special Publications, 300
3. D.R. Reddy (2020). A Monograph on Potential Geoparks of India, INTACH, New

	Delhi 4. 36th IGC (2016). Geotourism Hotspots of Indian Subcontinent, GSI, New Delhi 5. C. Sharples (2002). Concepts and Principles of Geoconservation, Tasmanian Parks and Wildlife Service, Australia 6. M. Gray (2004). Geodiversity – Valuing and Conserving Abiotic Nature, John Wiley & Sons Ltd., USA 7. R.K. Dowling and D. Newsome (2006). Geotourism – Sustainability, Impacts and Management, Elsevier Butterworth-Heinemann, Oxford 8. R, Crofts, J.E. Gordon, J. Brilha, M. Gray, J. Gunn, J. Larwood, V.L. Santucci, D. Tormey and G.L. Worboys (2020). Guidelines for Geoconservation in Protected and Conserved Areas, Best Practice Protected Area Guidelines, Series No. 31, IUCN, Switzerland
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Minor Theory 3 – Geomorphology and Hydrology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119216	Geomorphology and Hydrology	2	30	2 Hrs	30

Course Objectives:	• **To understand the processes responsible for the formation and evolution of landforms and the movement, distribution, and properties of water on Earth.** • **To study geomorphic agents, drainage systems, groundwater, and hydrological cycles in relation to environmental and geological processes.**			
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea Geomorphology. 2. Describe and interpret the various landform. 3. Acquire the knowledge of Geological work of wind, stream, Sea and glacial 4. Understand the basic idea hydrology. 5. Describe and interpret the various groundwater types and its properties			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Definition and scope of geomorphology Fundamental concepts and approaches Exogenic and endogenic processes, Fluvial cycle. Works of stream and rivers: River profile. Geological wok of river, methods of river erosion. Features of stream erosion. Sediments transport by rivers. Deposition by rives.	8 Hrs	8 Marks	
Unit II	Geological works of Sea: The sea wave and currents. Features of marine erosion. Marine deposition. karst topography, aeolian landforms, glacial landforms.	7 Hrs	7 Marks	
Unit III	Concept of hydrology, hydrogeology and ground water, Hydrologic cycle and its components, Occurrence and distribution of ground water, Water Table; Aquifer and its types – confined, unconfined and semiconfined. Properties of aquifer- porosity, permeability, specific yield, safe yields, storage coefficient, storativity and transmissivity.	8 Hrs	8 Marks	
Unit IV	Recharge and discharge, Darcy's Law and its validity Cone of depression, Influent and affluent seepages, Springs and its types. Ground water Provinces of India. Groundwater and water quality services, Hydrochemical parameters of ground water (Acidity, Alkalinity, Hardness, pH, Conductivity). Recharge through wells and its types. Rain water harvesting.	7 Hrs	7 Marks	
References:	**Text books:** Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.			

	Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. **Reference Books:** 1. Savindrasingh (1998): Geomorphology, Prayag Pushpak Bhavan, Allahabad. 2. Thornbury William D.: Principles of Geomorphology, Wiley Eastern, Pune. 3. Negi B.S.: Geomorphology, Kedernath Ramnath, Meerut. 4. Sharma V.K.: Geomorphology, Earth processes and forms, Tata McGraw Hill Publishing Co., New Delhi. 5. Worcester P.G.: Text book of Geomorphology. Allied Publ.N.Delh 6. Todd, D.K. (1980) Ground Water Hydrology. John Wiley and Sons Inc. New York. 7. Karanth, K.R. (1989) Hydrogeology. Tata McGraw Hill Pub.Co.Ltd., New Delhi. 8. Nagabhushaniah, H.S. (2001) Groundwater in Hydrosphere (Groundwater Hydrology) CBS Publisher, New Delhi. 9 Karanth K.R. Groundwater, Assessment, Development and Management. Tata McGraw Hill Pub. Co. Ltd., New Delhi. 10 Raghunath: Ground Water Hydrology, New Age Publication, Pune. 11. P. Arul Murugan, R.R. Krishnamurthy, groundwater targeting and coastal hydrogeological studies" Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical – 9: Geomorphology and Hydrology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119217	Geomorphology and Hydrology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To develop practical skills in the identification, analysis, and interpretation of landforms, drainage patterns, and hydrological features through maps, models, and field observations.** • **To understand geomorphic and hydrological processes, including erosion, weathering, groundwater movement, and watershed characteristics, using laboratory and practical techniques.**
Course Outcomes:	**After completing the course, the student will** 1. Reading topographic map 2. Morphometric analysis

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Preparation of longitudinal profile of river Reading topographic map Preparation of longitudinal profile of river Calculating different morphometric parameters Preparation of geomorphic map	**4 Hrs per week**	**2**	
Plotting of Ground water provinces on outline map of India. Ground water table contour maps Problems on determination of Aquifer Parameters			

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I. Reading topographic map.	02 Marks
II. Calculating different morphometric parameters	04 Marks
III. preparation of geomorphic map	02 Marks
IV Plotting of Ground water provinces on outline map of India	02 Marks
V Ground water table contour maps	02 Marks
III. Problems on determination of Aquifer Parameters.	04 Marks
Field Work.	02 Marks
IV Practical Record	03 Marks
V Viva Voce	02 Marks
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	25 Marks

GOEC Theory 5: Environmental geology

Level	Semester	Course Code	Course Name		Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119218	Environmental geology		2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• To understand the relationship between geological processes and the environment, including natural hazards, resource management, and environmental degradation. • To study environmental problems related to land, water, minerals, and pollution, and to develop awareness of sustainable geological and environmental practices.			
Course Outcomes:	After completing the course, the student will 4. Understand the Students learn about the natural hazards and their mitigations 5. Equally, it gives an idea of managing resources. 6. Explain the Geologic resources and issues also able to understand the interactions between geologic processes, ecological processes, and society. 7. Environment, human activity , Climate change process and able to demonstrate awareness of competing concerns (including economic, social, & biological tradeoffs) that arise in environmental geologic decision making.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Basic of Environmental Geology and its fundamental concept, our place in the environment. The earth systems and cycles, earth structure and materials.	8 Hrs	8 Marks	
Unit II	Environmental impact of Hazardous geologic processes: assessing geologic hazards and risks of earthquakes, volcanic activity,	7 Hrs	7 Marks	
Unit III	Fundamental causes and effect of tsunamis, landslides, floods and its impacts on environment.	8 Hrs	8 Marks	
Unit IV	Basic concept of Surface water and groundwater and its management. water quality parameters suitability for life	7 Hrs	7 Marks	
References:	Text books: 1. Text Book of Environmental Geology: By Edward A. Keller., Prentice Hall. 2. A Concise Textbook Of Environmental Geology by B.S. Rathore 3. Text Book Barbara W M, Brain J S, Stephen C P, 1996, Environmental Geology, John Wiley and Sons Inc. New York. Reference Book: 1. Environmental Geology: Earth System: An Earth Systems Approach., W.H. Freeman & Co Ltd. 2. Environmental Geology, by Montgomery C W., William C. Publisher, Brown USA. 3. Akhtar R, 1991, Environment and Health: Themes in Medical Geography, Pak Book Corporation. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

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Vocational Skill Course Lab/Practical 10: Rainwater harvesting

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119219	Rainwater harvesting	2	60	3 Hrs	50

Course Objectives:	• **Understand the concept, importance, and types of rainwater harvesting (RWH) systems.** • **Identify and study the components of an RWH system such as catchment areas, gutters, pipes, filters, and storage units.** • **Observe and locate potential rainwater collection points in real-life settings like homes or colleges.** • **Design and sketch simple RWH systems and create practical or demonstration models to learn their working and benefits.**			
Course Outcomes:	**After completing the course, the student will** Learn the Importance, Application of Rainwater harvesting			
Unit System	**Contents**	**Workload Allotted**	**Credit**	**Marks and exam duration**
	Introduction, Definition, Importance, Application, Types of RWH. Components of an RWH System (catchment, gutters, pipes, filters, storage). observe and identify potential rainwater collection points, design simple RWH systems for homes or colleges, sketch a basic system layout, and create a practical or demonstration model to understand its working and benefits.	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**
Practical Internal Activity 1. Perform any 5 experiment/model/ Map 30 Marks 2. Field work 10 Marks 3. Internal Viva 10 Marks				
References:	2. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Geology FP/CEP- Project

Geology FP/CEP- Project 119220	
Field Project / CE Services in Geology: Phase-I	
Credits: 02	**Workload (Hrs./Week): 04**
Course Objectives:	1. To provide hands-on experience in applying theoretical geology knowledge to real-world challenges through field-based projects or community engagement (CE) services. 2. To train students in identifying, problems encountered in Geology and hydrology-related fieldwork or community service activities. 3. To encourage students to integrate geology and field geology concepts with interdisciplinary knowledge, technology, and societal needs. 4. To develop students' abilities to document, present, and communicate their field-based or community engagement work effectively to diverse audiences. 5. To instill a sense of responsibility and service by involving students in projects that address community issues related to science and technology.
Course Outcomes:	1. Students will be able to apply geology related analytical techniques to investigate and solve real-world problems in field settings. 2. Students will demonstrate proficiency in using experimental tools, instruments, and data analysis methods relevant to their field project or CE service. 3. Students will be able to design, plan, and execute a field geology project or community service activity from inception to completion, including documentation and reporting. 4. Students will effectively communicate their project findings and outcomes through written reports, presentations, or community engagement events.

	5. Students will demonstrate an understanding of the ethical, environmental, and societal impacts of their work, showing a commitment to responsible scientific practice and community well being.
Guidelines/SOP for Selection and Implementation of Field Projects / CE Services	
1. Project Selection and Planning	• **Faculty Guidance:** Students will be assigned a faculty mentor to guide their project, providing expertise and resources. • **Project Topic:** The project topic should be relevant to Geology and align with the student's interests and the available resources. • **Literature Review:** Students are expected to conduct a thorough literature review to understand existing knowledge and identify research gaps. • **Data Collection and Analysis:** Projects often involve experiments, field sampling , simulations, or data analysis from existing sources, depending on the topic. • Project Timeline: The total time allocation for the student to carry out field project is 60 hours.
2. Data Analysis and Interpretation	• **Statistical Methods**: Students will learn and apply appropriate statistical methods to analyze data. • **Interpretation of Results:** Data should be interpreted within the context of the project, highlighting significant findings and limitations.
3. Report Writing and Presentation	• **Report Format**: A structured report format is usually followed, including an abstract, introduction, methodology, results, discussion, and conclusion. • **Data Presentation**: Data should be presented clearly and accurately using tables, graphs, and figures. • **Oral Presentation:** Students will be required to present their findings to peers and faculty.
4. CE Services (Community Engagement)	• **Community Needs**: Projects may focus on addressing specific community needs or challenges relevant to physics. • **Collaboration:** Students can collaborate with local organizations to implement their projects. • **Impact Assessment**: The impact of the project on the community should be evaluated**.**
5. Evaluation and Assessment	• **Project Report:** The final report will be assessed based on its content, organization, and the quality of the research. (20 Marks) • **Oral Presentation:** The presentation will be evaluated on clarity, engagement, and the ability to answer questions. (10 Marks) • **Faculty Evaluation:** The faculty mentor will assess the student's performance throughout the project. (20 Marks) • **Total 50 Marks**
Examples of Field Projects/CE Services in Physics	• **Environmental Geology**: Studying the impact of pollution on local ecosystems or developing renewable energy solutions. • **Hydrogeology**: Collect water sample in filed near college or village and analysis the water samples physical and chemical parameters and Investigating the effects of ground water • **Drainage Basin Analysis:** Mapping a drainage basin and analyzing its slope to understand geomorphic processes • **Community Outreach:** Organizing science workshops or engaging in scientific literacy initiatives. • **Research Project:** Study related to the subject that contribute to the advancement of knowledge and the well-being of life on Earth.

SECOND YEAR: SEMESTER – IV

Mode of Teaching	Vertical No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical) / Outdoor / Field	a.	Major	Theory5	119221	Sedimentology and Metamorphic Petrology	2	2	10
			Theory6	119222	Geophysics	2	2	
			Theory 7	119223	Stratigraphy	2	2	
			Lab/Practical-11	119224	Sedimentary, Metamorphic, and Geophysics	2	4	
	b.	Minor	Theory4	119225	Petrology	2	2	6
			Lab/Practical-12	119226	Petrology	2	4	
	c.	Generic / Open Elective	Theory6	119227	Disaster management	2	2	2
	d.	VSC	Lab/Practical-13	119228	Watershed management	2	4	4
	e.	AEC - English	Theory			1	1	2
		AEC – MIL	Theory			1	1	
	f.	FP/CES	Project	119229		2	4	8
		CC	Outdoor			2	4	
		TOTAL				**22**	**32**	**32**

Major Theory - Sedimentology and Metamorphic Petrology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119221	Sedimentology and Metamorphic Petrology	2	30	2 Hrs	30

Course Objectives:	• **Understand the formation, classification, and structures of sedimentary rocks, including depositional environments like aeolian and fluvial.** • **Study sedimentary petrology, focusing on deposits of chemical and organic origin and the characteristics of common sedimentary rocks.** • **Learn the agents, types, and processes of metamorphism, along with classification, textures, and structures of metamorphic rocks.** • **Explore metamorphic petrology, including stress/anti-stress minerals, metasomatism, and features of common metamorphic rocks.**			
Course Outcomes:	**After completing the course, the student will** 1. Explain and describe the formation, classification and structure of sedimentary rocks. 2. Explain and describe the formation, classification and structure of metamorphic rocks. 3. Students will be able to identify common sedimentary and metamorphic rocks 4. Understand the basic idea about depositional environment of sedimentary rocks.			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Sedimentary Rocks: formation of sedimentary rocks – erosion, transportation and deposition, diagenesis and lithification. Classification of sedimentary rocks, sedimentary structures, sedimentary depositional environment, concept, types of environments – Aeolian, Fluvial	8 Hrs	8 Marks	
Unit II	Sedimentary Petrology: Deposit of chemical origin – concretions, secretions, colloids, siliceous, carbonate, ferrugineous, salts. Deposits of organic origin; organic rocks of calcareous origin, phosphatic deposits of organic/siliceous. Deposition of organic origin and carbonaceous deposits. Characters of common sedimentary rocks.	7 Hrs	7 Marks	
Unit III	Metamorphic Rocks: Agents of metamorphism; kinds of metamorphism; classification of metamorphic rocks, textures and structures of metamorphic rocks, cataclastic, thermal, dynamothermal and plutonic metamorphism.	8 Hrs	8 Marks	
Unit IV	Metamorphic Petrology; Stress and Antistress minerals, Metasomatism – types and additive processes. Injection, pneumatolytic and autometamorphism. Characters of common metamorphic rocks.	7 Hrs	7 Marks	
References:	**Text books:** Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. **Reference Books:** Dynamic Earth: Skinner Potter - Pub.John, Wiley. Concepts in Geology: Chakranarya, Kulkarni, Pub.Scientific Publication, Pune. 101 102 Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub.Book World Enterpress-Bombay. Principles of Petrology: G.W.Tyrell (1998) B.I.Publications Pvt.Ltd., New Delhi. Geology of Maharashtra: Deshpande, G.G. (1998). Geological Society of India, Bangalore. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India. A study of rock in thin section: W. W. Moorhouse, Harper and sons Publication Igneous and Metamorphic Petrology: Turner, F. J and Verhoogen, J, McGraw Hill Sedimentary petrology: Pettijohn, H. J, Harper and Brothers. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Major Theory - Geophysics

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119222	Geophysics	2	30	2 Hrs	30

Course Objectives:	• **Understand the basic idea about Mineral exploration.** • **Describe and interpret the various sub surface methods of exploration**			
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about Geophysics 2. Describe and interpret the various geophysical surface and subsurface methods			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Gravity methods: Principles, instruments, field procedures, reduction of gravity datum, gravity anomaly maps, data interpretation and applications. Magnetic methods: Principles, instruments, field procedures, reduction of data, preparation of magnetic anomaly maps and profiles, airborne magnetometers, data interpretation and its applications.	8 Hrs	8 Marks	
Unit II	Electrical methods: resistivity methods - Principles, instruments, field procedures, interpretation and applications. Electromagnetic methods: Principles, instruments, lateral exploration, electromagnetic depth soundings, interpretation and applications. Induced Polarization methods: Principles, Instruments, field procedures, interpretation and applications, self-potential method	7 Hrs	7 Marks	
Unit III	Seismic methods - Refraction methods - principle, instruments equipments; Operational Methods - Fan shooting, arc shooting, profile shooting, correlation method of refracted waves, reduction of data, interpretation of data and applications. Seismic surveys, velocity determination, elevation and weathering corrections, data processing, plotting of depth sections, interpretation and applications.	8 Hrs	8 Marks	
Unit IV	Geochemical exploration - Geochemical principles - Geochemical cycle, primary and secondary dispersion patterns, geochemical anomalies and background values, geochemical surveys. geobotonical methods and their applications in Geology.	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. **Reference Books:** 1. McKinstry, H.E. (1972) Mining Geology. Prentice – Hall Inc. 2. Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH publishing Co., New Delhi 3. Howel, B.F. (1959) Introduction to Geophysical prospecting. McGraw Hill 4. Lowrie, W. (1997) Fundamentals of Geophysics. Cambridge University Press. 5. Dobrin, M.B. (1952) Introduction to Geophysical Prospecting. McGraw Hill Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Major Theory – Stratigraphy

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	11923	**Stratigraphy**	2	30	2 Hrs	30

Course Objectives:	• **To understand the principles of stratigraphy, geological time scale, and the classification and correlation of rock strata.** • **To study the stratigraphic succession, fossil records, and geological history of rock formations for interpreting Earth's evolution and resource distribution.**			
Course Outcomes:	**After completing the course, the student will** 3. Understand the basic idea about Stratigraphy 4. Describe and interpret the various stratigraphical Supergroup and group			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Introduction- principles and importance. Stratigraphic classification: lithostratigraphic, chronostratigraphic and biostratigraphic units. Physiographical division of India, Geological time scale; Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Archaean Supergroup,.	8 Hrs	8 Marks	
Unit II	Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Dharwar Supergroup, Sausar Group, Sakoli Group, Cuddapah Supergroup; Delhi Supergroup;	7 Hrs	7 Marks	
Unit III	Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Vindhyan Supergroup; Kurnool group, Gondwana Supergroup	7 Hrs	7 Marks	
Unit IV	Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Jurassic of Kutch, Deccan Trap, Lameta Formation, Bagh Beds, Cretaceous of Narmada valley and Trichonopoly. Siwalik Group, Stratigraphy of Maharashtra.	8 Hrs	8 Marks	
References:	**Text books:** Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi. **Reference Books:** Ravindrakumar: Fundamentals of Historical Geology and Stratigraphy of India. Krishnan M.S.: Geology of India and Burma Wadia, D. N.: Geology of India. Deshpande G.G.: Geology of Maharashtra. Ramkrishnan and Vaidyanadhan: Geology of India, Volume I and II, Geological Society of India, Bangalore. M.A. Koregave (1998) Fundamentals of Invertebrate Palaeontology. Book World Enterprises, Mumbai. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical – 11: Sedimentary Metamorphic and Geophysics

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119224	**Sedimentary Metamorphic and Geophysics**	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To develop practical skills in the identification and interpretation of sedimentary and metamorphic rocks based on their textures, structures, and mineral composition.** • **To understand basic geophysical methods and their application in studying subsurface structures and geological processes.**

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Course Outcomes:	**After completing the course, the student will** 1. Students will be able to identify the megascopic and microscopic properties of Sedimentary and Metamorphic rocks 2. Laboratory exercises

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Megascopic identification of common Sedimentary rock Megascopic identification of common Metamorphic rock Microscopic identification of common Sedimentary Microscopic identification of common Metamorphic rock	**4 Hrs per week**	**2**	
Laboratory exercises in solving exploration related problems. Exercises on calculation of grade and ore Reserves.			
Field Work.			

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

i)	Megascopic identification of Sedimentary rock (04 samples)	04 marks
ii)	Megascopic identification of Metamorphic rock (04 samples)	04 marks
iii)	Microscopic identification of Sedimentary rock (04 samples)	04 marks
iv)	Microscopic identification of Metamorphic rock (04 samples)	04 marks
v)	Laboratory exercises in solving exploration related problems	04 marks
vi)	Record	03 marks
vii)	Viva-voce	02 marks
		Total – 25 marks

Minor Theory 4 – Petrology

Level	**Semester**	**Course Code**	**Course Name**	**Credits**	**Teaching Hours**	**Exam Duration**	**Max Mark**
4.5	4	119225	Petrology	2	30	2 Hrs	30

Course Objectives:	• **To understand the origin, composition, classification, and texture of igneous, sedimentary, and metamorphic rocks and the processes responsible for their formation.** • **To study the petrographic characteristics of rocks and their significance in interpreting Earth's geological history and tectonic settings.**
Course Outcomes:	**After completing the course, the student will** 1 Explain and describe the formation, classification, and structure of igneous rocks. 2. Explain and describe the formation, classification and structure of sedimentary rocks. 3. Explain and describe the formation, classification and structure of metamorphic rocks. 4. Description of common Igneous, sedimentary and metamorphic rocks 5. Describe the depositional environment of sedimentary rocks.

Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Definition of petrology, petrography, petrogenesis. Concept of rock cycle, Igneous rocks: Magma and its composition, pyrogenetic minerals, formation of crystals and glass; intrusive – concordant and discordant forms of igneous rocks. Extrusive forms. Texture in Igneous rocks: definition, types and controlling factors- crystallinity, granularity, shape of crystals and mutual relations, equigranular (granitic), inequigranular (porphyritic), directive and intergrowth, glassy. Structure in Igneous Rocks: vesicular, amygdaloidal, blocky, pillow, flow and columnar joints; distinction between textures and structures.	8 Hrs	8 Marks	
Unit II	Evolution of Magma: Differentiation, Fractional Crystallization, Magmatic assimilation. Classification of Igneous rocks: IUGS Classification. Other aspects of classification – Plutonic,Hypabyssal and Volcanic, Chemical, Silica based, Silica saturation, CIPW, mineralogical, Colour index and Tabular Classification.	7 Hrs	7 Marks	

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	Bowens Reaction series, Characteristics of acidic, alkaline and basic igneous rocks. Characters of some common igneous rocks and their Indian occurrences			
Unit III	Sedimentary Rocks: formation of sedimentary rocks – erosion, transportation and deposition, diagenesis and lithification. Classification of sedimentary rocks, sedimentary structures. Deposit of chemical origin – concretions, secretions, colloids, siliceous, carbonate, ferrugineous, salts. Deposits of organic origin; organic rocks of calcareous origin, phosphatic deposits of organic/siliceous. Deposition of organic origin and carbonaceous deposits. Characters of common sedimentary rocks.	8 Hrs	8 Marks	
Unit IV	Metamorphic Rocks: Agents of metamorphism; kinds of metamorphism; classification of metamorphic rocks, textures and structures of metamorphic rocks, cataclastic, thermal, dynamothermal and plutonic metamorphism. Metamorphic Petrology; Stress and Antistress minerals, Metasomatism – types and additive processes. Injection, pneumatolytic and autometamorphism. Characters of common metamorphic rocks.	7 Hrs	7 Marks	
References:	**Text books:** Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. **Reference Books:** Dynamic Earth: Skinner Potter - Pub.John, Wiley. Concepts in Geology: Chakranarya, Kulkarni, Pub.Scientific Publication, Pune. 101 102 Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub.Book World Enterpress-Bombay. Principles of Petrology: G.W.Tyrell (1998) B.I.Publications Pvt.Ltd., New Delhi. Geology of Maharashtra: Deshpande, G.G. (1998). Geological Society of India, Bangalore. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India. Optical Mineralogy; Winchell A study of rock in thin section: W. W. Moorhouse, Harper and sons Publication Igneous and Metamorphic Petrology: Turner, F. J and Verhoogen, J, McGraw Hill Sedimentary petrology: Pettijohn, H. J, Harper and Brothers. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Minor Lab / Practical – 12: Petrology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119226	Petrology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To develop practical skills in the identification and classification of igneous, sedimentary, and metamorphic rocks using hand specimens and thin sections.** • **To understand petrographic techniques and interpret rock textures and mineral assemblages to infer rock origin and geological history.**
Course Outcomes:	**After completing the course, the student will** Megascopic identification of Rock Microscopic identification of Rock Construction of paragenetic triangular graphs.

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Megascopic identification of igneous, sedimentary and metamorphic rocks (At list 25 rock	**4 Hrs per week**	**2**	
Microscopic study of igneous, sedimentary and metamorphic rocks (15 slide)			
Exercise on ACF, AKF and AFM diagrams			

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

i)	Megascopic identification of igneous, sedimentary and metamorphic rocks (As in theory) (08 samples)	08 marks
ii)	Rocks in thin section (As in theory) (03 slides)	06 marks
iii)	Exercise on ACF, AKF and AFM diagrams	06 marks
iv)	Record	03 marks
v)	Viva-voce	02marks
	Total –	25 marks

GOEC Theory 6: Disaster management

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119227	Disaster management	2	30	2 Hrs	30 (External) 20 (Internal)

Course Objectives:	• **Understand the basic concepts and phases of disaster management, including disaster types, response, recovery, mitigation, and preparedness** • **Study natural and man-made hazards, such as earthquakes, floods, cyclones, volcanoes, and their mitigation strategies.** • **Explore causes and control measures for droughts, landslides, coastal hazards, forest fires,** **and global warming.** • **Learn the role of early warning systems, risk analysis, and the application of Remote Sensing & GIS in disaster management.**
Course Outcomes:	**After completing the course, the student will** 1. Students learn about the concepts of disaster management and types of disasters 2. Students distinguish between natural and man-made disasters. 3. Students will able to prepare a model for disaster management. 4. Students will able to understand disaster management warning systems for disaster risk reductions.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Concepts and definition of Disaster, Concepts and definition of Disaster, Response, Recovery, Mitigation and preparedness, Introduction to Various Hazards both Natural and Man-Made Hazards	8 Hrs	8 Marks	
Unit II	Introduction and mitigating measures for Earthquakes, Cyclones and Floods and Volcano Hazards.	7 Hrs	7 Marks	
Unit III	Causes and controlling measures to minimize Droughts, Coastal Hazards, Landslides, Forest Fires and Global Warming.	8 Hrs	8 Marks	
Unit IV	Early warning system for different hazards, Risk Analysis for Individuals, communities. Role of Geological awareness, Remote Sensing & GIS in Disaster Management.	7 Hrs	7 Marks	

References:

Text books:

1. Roy, P. S. (2000): Natural Disaster their Mitigation, IIRS, Dehradun.
2. H.K.Guptha, ―Disaster management‖, 2ndEdition, University Press, 2001.
3. Text Book of Environmental Geology: By Edward A. Keller., Prentice Hall.
4. A Concise Textbook Of Environmental Geology by B.S.Rathore
3. Text Book Barbara W M, Brain J S, Stephen C P, 1996, Environmental Geology, John Wiley and Sons Inc. New York.

Reference Book:

1. R. B. Singh (Ed), ―Disaster Management‖, Rawat Publication, New Delhi, 2000.
2. Gupta, M.C., ―Manuals on Natural Disaster management in India‖,National Centre for Disaster Management, IIPA, New Delhi, 2002.
3. Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov. 21-22, 2000, IIT, Kharagpur.

Weblink to Equivalent MOOC on SWAYAM if relevant:
Weblink to Equivalent Virtual Lab if relevant:
Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Vocational Skill Course Lab/Practical 13: Watershed management

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	4	119228	Watershed management	2	60	3 Hrs	50

Course Objectives:	• **Learn to prepare and delineate watershed maps using toposheets and understand watershed fundamentals.** • **Develop skills in watershed assessment, prioritization, and planning for sustainable resource management** • **Design and draw a basic watershed management plan incorporating key conservation and planning strategies** • **Gain practical exposure through case studies and field visits to understand real-world watershed management practices.**
Course Outcomes:	**After completing the course, the student will** 1. Understand toposheet reading. 2. Identify the megascopic properties of various rocks. 3. Prepare and interpret the watershed map. 4. Understand delineation of watershed using toposheet. 5. Understand watershed prioritisation.

Unit System	Contents	Workload Allotted	Credit	Marks and exam duration
	Toposheet reading. Megascopic identification of rocks. Preparation of watershed map. Delineation of watershed using toposheet. Watershed prioritisation. Watershed Fundamentals Watershed Assessment and Planning Developing a watershed management plan and draw Watershed Management Case Studies Visit to watershed	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**

Practical Internal Activity

1. Perform any 5-experiment/model/ Map 30 Marks
2. Field work 10 Marks
3. Internal Viva 10 Marks

References:	1. Tyrell, G. W. (1963), Principles of Petrology, Metheun. 2. Das M. M. and Saikia M.D. (2013), Watershed Management, PHI Learning Pvt. Ltd.
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Geology FP/CEP- Project

Geology FP/CEP- Project -119229	
Field Project / CE Services in Geology: Phase-II	
Credits: 02	**Workload (Hrs./Week): 04**
Course Objectives:	6. To provide hands-on experience in applying theoretical geology knowledge to real-world challenges through field-based projects or community engagement (CE) services. 7. To train students in identifying, problems encountered in Geology and hydrology-related fieldwork or community service activities. 8. To encourage students to integrate geology and field geology concepts with interdisciplinary knowledge, technology, and societal needs. 9. To develop students' abilities to document, present, and communicate their field-based or community engagement work effectively to diverse audiences. 10. To instill a sense of responsibility and service by involving students in projects that address community issues related to science and technology.
Course Outcomes:	6. Students will be able to apply geology related analytical techniques to investigate and solve real-world problems in field settings.

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	7. Students will demonstrate proficiency in using experimental tools, instruments, and data analysis methods relevant to their field project or CE service. 8. Students will be able to design, plan, and execute a field geology project or community service activity from inception to completion, including documentation and reporting. 9. Students will effectively communicate their project findings and outcomes through written reports, presentations, or community engagement events. 10. Students will demonstrate an understanding of the ethical, environmental, and societal impacts of their work, showing a commitment to responsible scientific practice and community well being.
Guidelines/SOP for Selection and Implementation of Field Projects / CE Services	
1. Project Selection and Planning	• **Faculty Guidance:** Students will be assigned a faculty mentor to guide their project, providing expertise and resources. • **Project Topic:** The project topic should be relevant to Geology and align with the student's interests and the available resources. • **Literature Review:** Students are expected to conduct a thorough literature review to understand existing knowledge and identify research gaps. • **Data Collection and Analysis:** Projects often involve experiments, field sampling, simulations, or data analysis from existing sources, depending on the topic. • Project Timeline: The total time allocation for the student to carry out field project is 60 hours.
2. Data Analysis and Interpretation	• **Statistical Methods**: Students will learn and apply appropriate statistical methods to analyze data. • **Interpretation of Results:** Data should be interpreted within the context of the project, highlighting significant findings and limitations.
3. Report Writing and Presentation	• **Report Format**: A structured report format is usually followed, including an abstract, introduction, methodology, results, discussion, and conclusion. • **Data Presentation**: Data should be presented clearly and accurately using tables, graphs, and figures. • **Oral Presentation:** Students will be required to present their findings to peers and faculty.
4. CE Services (Community Engagement)	• **Community Needs**: Projects may focus on addressing specific community needs or challenges relevant to physics. • **Collaboration:** Students can collaborate with local organizations to implement their projects. • **Impact Assessment**: The impact of the project on the community should be evaluated**.**
5. Evaluation and Assessment	• **Project Report:** The final report will be assessed based on its content, organization, and the quality of the research. (20 Marks) • **Oral Presentation:** The presentation will be evaluated on clarity, engagement, and the ability to answer questions. (10 Marks) • **Faculty Evaluation:** The faculty mentor will assess the student's performance throughout the project. (20 Marks) • **Total 50 Marks**
Examples of Field Projects/CE Services in Physics	• **Environmental Geology**: Studying the impact of pollution on local ecosystems or developing renewable energy solutions. • **Hydrogeology**: Collect water sample in filed near college or village and analysis the water samples physical and chemical parameters and Investigating the effects of ground water • **Drainage Basin Analysis:** Mapping a drainage basin and analyzing its slope to understand geomorphic processes

	• **Community Outreach:** Organizing science workshops or engaging in scientific literacy initiatives. • **Research Project:** Study related to the subject that contribute to the advancement of knowledge and the well-being of life on Earth.

Note: The extended portion of the Field Project/CE Services in Geology from Phase-I may be carried forward as Field Project/CE Services in Geology: Phase-II in the fourth semester, subject to the approval of the assigned faculty mentor.

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

THREE-YEAR UNDERGRADUATE PROGRAMME

Bachelor of Science (B.Sc.)

Subject: GEOLOGY

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2026-2027
Under Uniform NEP 2020)

SYLLABUS

Semester V and VI

THIRD YEAR: SEMESTER – V

Mode of Teaching	Ver. No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical) / Outdoor / Field	a.	Major	Theory 8	119230	Structural and Tectonics Geology	2	2	16
			Theory 9	119231	Engineering Geology	2	2	
			Theory 10	119232	Geomorphology	2	2	
			Lab/Practical-15	119233	Structural, Tectonics Geology and Geomorphology	2	4	
		Major (Elective)	Theory1	119234	Paleontology	2	2	
			Lab/Practical-16	119235	Paleontology	2	4	
			Theory1	119236	Environmental Geology			
			Lab/Practical-16	119237	Environmental Geology			
	b.	Minor	Theory 5	119238	Indian Stratigraphy and Paleontology	2	2	6
			Lab/Practical-17	119239	Indian Stratigraphy and Paleontology	2	4	
	c.	Generic/ Open Elective	-	-	-	-	-	-
	d.	VSC	Lab/Practical-18	119240	Gemology	2	4	8
		SEC	Lab/Practical- 19	119241	Tools and Techniques in Geology	2	4	
	e.	VEC	-	-	-	-	-	0
	f.	FP/CES	Project	119242		2	4	4
		CC	-	-	-	-	-	-
		TOTAL				**22**	**34**	**34**

Major Theory 8 – Structural and Tectonics Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119230	Structural and Tectonics Geology	2	30	2 Hrs	30

Course Objectives:	• **To understand the fundamental concepts of structural geology such as stress, strain, and rock deformation, and their role in the formation of geological structures.** • **To study major tectonic processes including plate tectonics and their influence on the origin of mountains, faults, folds, rift valleys, and other crustal features.** • **To develop the ability to interpret and analyze geological structures using field observations, maps, and cross-sections, and relate them to tectonic activity such as earthquakes and volcanism.**
Course Outcomes:	**After completing the course, the student will** 1 Understand the basic idea about structure geology and plate tectonic. 1. Describe and interpret the various structure 2. To improve the knowledge of isostacy and plate tectonics

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Attitude of bed. Clinometer and Brunton compass and its use, Outcrop in relation to topography and structure. Erosional structures – Unconformity: formation, types and recognition. Recognition of unconformities in field and map; Outlier-inlier, onlap, offlap, windows and klippe. Nappe	8 Hrs	8 Marks	
Unit II	Stress and strain: definition and types; Interrelationship of Types of deformation plastics, elastic, brittle stress-strain and time, Mohr's Circle. Fold: Definition and terminology; classification – genetic and geometric; recognition of fold in field and map, causes of folding	7 Hrs	7 Marks	
Unit III	Faults: definition and terminology; classification of faults; causes of faulting, recognition of fault in field and map. Foliation and lineation – kinds and origin. Joints: definition and terminology; classification of joints; significance of joints.	8 Hrs	8 Marks	
Unit IV	Isostacy, Geosyncline - Definition, classification and evolution of mountains. Continental drift - evidences of drift. Plate tectonics - types of plate margins, causes of plate movement, evidences of plate tectonics. Sea floor spreading, Palaeomagnetism.	7 Hrs	7 Marks	

References:

Text books:

Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.
Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.

Reference Books:

Structural Geology:

Bilings, M.P. (1997) Structural Geology. Prentice-Hall of India Pvt. Ltd., New Delhi.
Park, R.G. (1989) Foundations of Structural Geology. Blackie, New York.
Gokhale, N.W.(2001) Theory of Structural Geology. Blackie, New York.
Gokhale, N.W.(1991) A Manual of Problems of Structural Geology. CBS Publishers.
Lahi, F.H. (1987) Field Geology, CBS Publishers.
Gokhale, N.W. (2001) A Guide to Field Geology. CBS Publishers.
Chiplonkar G.W: Geological Maps, Dastane Ramchandra Publication, Pune

Tectonics:

Dynamic Earth - Skinner Potter - Pub.John, Wiley.
Dynamic Earth – Patwardhan A.M., E E.E Publications, New Delhi.
Dynamic Earth- Whiley, John Wiley and Sons, New York.
General Geology, Radhakrishnan N. ,V.V.P Pub, Vellore.

Weblink to Equivalent MOOC on SWAYAM if relevant:
Weblink to Equivalent Virtual Lab if relevant:
Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

Model Questions: Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Major Theory 9 – Engineering Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119231	Engineering Geology	2	30	2 Hrs	30

Course Objectives:	• **To understand engineering properties of rocks and soils for construction purposes.** • **To study geological factors affecting site selection for dams, tunnels, roads, and buildings.** • **To identify and manage geological hazards for safe engineering planning.**			
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about the importance of geological studies and its applicability to various engineering problems. 2. To improve the knowledge of Site investigations			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Engineering Geology – introduction, scope and significance; engineering properties of rocks - specific gravity, porosity, crushing strength, compressive strength, and tensile strength, shear strength, Deformational characters - modulus of elasticity, poisson ratio., Residual stress. Importance of weathering and clay formations	8 Hrs	8 Marks	
Unit II	Engineering classification of rock masses – Rock quality designation, rock structure rating, rock mass rating system, rock quality index system. Susceptibility or rocks towards weathering. Engineering properties of soils. Ground improvement - grouting, types, procedures, grouting applications.	7 Hrs	7 Marks	
Unit III	Dams – terminology, geological conditions for the selection of dam, Types of dams - Masonary dams (Gravity buttress and Arch types), earthen dams. Landslides - causes, types and prevention of landslides. Location with type of all the important dams and hydroelectric projects in India.	8 Hrs	8 Marks	
Unit IV	Tunnels - terminology, geological conditions for tunnel sites, tunnels in folded rocks and bedded rocks. Bridges: Types, abutment and foundation problems across river and valley crossing. Tunnelling in various terrains like tunnel in bedded rocks and folded rocks, influence of divisional planes, effects of faults and crushed zones. geological investigations for construction of bridges. Types of bridges and Site selection for bridge construction. Names and locations of at least six very important bridges in India. Case study: Mumbai Sea-Link	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology - Parbin Singh, Katson Publishing, Ludhina. 2 2. R B Gupte, Text Book of Engineering Geology,Published by Pune Vidyarthi Griha Prakashan 3. Hand book of analysis of water sample **Reference Books:** 1. Blyth, F.G.H. and M. H. de Freitas (1984) Geology for Engineers, Butterworth - Heinemann Title 2. Krynine, D.P and Judd, W.R (2005) Principles of Engineering Geology and Geotechniques, CBS Publishers & Distributors 3. Ries, H. and T. L. Watson, (1949) Elements of Engineering Geology, New York, John Wiley & Sons, Inc. 4. Tony Waltham (2009) Foundations of Engineering Geology, Taylor and Francis. 5. Chenna Keshvallu (2018) Text book of Engineering Geology, Laxmi Publications. 6 6. Gokhale, K.V.G. (2006) Principles of engineering geology, BS publications. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Major Theory 10 – Geomorphology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119232	Geomorphology	2	30	2 Hrs	30

Course Objectives:	• **To understand the basic concepts of geomorphology and the processes shaping Earth's landforms.** • **To study major geomorphic agents such as rivers, wind, glaciers, waves, and tectonic forces.** • **To analyze the development and evolution of different landforms and landscapes over geological time.**
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea Geomorphology. 2. Describe and interpret the various landform. 3. Acquire the knowledge of Geological work of wind, stream, Sea and glacial

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Scope and aim of geomorphology. Fundamental concepts, Exogenic and endogenic processes, Fluvial cycle. Works of stream and rivers: River profile.	8 Hrs	8 Marks	
Unit II	Geological wok of river, methods of river erosion. Features of stream erosion. Sediments transport by rivers. Deposition by rives. River meandering. Geological works of Sea: The sea wave and currents. Features of marine erosion. Marine deposition. Karst topography	7 Hrs	7 Marks	
Unit III	Geological work of glacial: Glacial morphology. Types glacial. Glacial erosion. Feature of glacial erosion. Glacial transport. Movement of glacial. Glacial deposits.	8 Hrs	8 Marks	
Unit IV	Drainage system and pattern and their significance; Morphometric analysis- basic principles and techniques of river basin analysis	7 Hrs	7 Marks	

References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. 3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. **Reference Books:** 1. Savindrasingh (1998): Geomorphology, Prayag Pushpak Bhavan, Allahabad. 2. Thornbury William D.: Principles of Geomorphology, Wiley Eastern, Pune. 3. Negi B.S.: Geomorphology, Kedernath Ramnath, Meerut. 4. Sharma V.K.: Geomorphology, Earth processes and forms, Tata McGraw Hill Publishing Co., New Delhi. 5. Worcester P.G.: Text book of Geomorphology. Allied Publ.N.Delhi
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical – 15: Structural and Tectonics Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119233	Structural and Tectonics Geology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **Identification and study of major structural features like folds, faults, and joints.** • **Interpretation of geological maps and preparation of simple cross-sections.** • **Basic measurement and representation of strike and dip of rock layers.**
Course Outcomes:	**After completing the course, the student will** **1.** Problems on Dip, Strike, Thickness of Beds and width of outcrop maps. 2. Section drawing and interpretation. 3. Morphometric Analysis**.**

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Contents	Workload Allotted	Credit	Incorporation of Pedagogies
1. Use of Clinometer and Brunton compass 2. Outcrop- its true and apparent thickness, width of outcrop; problems on dip, strike, thickness of beds and width of outcrop (at least 10 problems) 3. Completion of outcrop - problems for conformable series and its structures (at least 05 maps). 4. Section drawing- Identification and interpretation of various landforms, geological successions, structures and geological history. Geological section drawing and interpretation for conformable series (at least 10 maps with different structures).	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

i)	Problems on Dip, Strike, Thickness of Beds and width of outcrop maps (One problem)	05 marks
ii)	Completion of outcrop maps (One map)	05 marks
iii)	Section drawing and interpretation. (One section)	05 marks
iv)	Morphometric Analysis	05 marks
	Record	03 marks
v)	Viva-voce	02marks
	Total – 25 marks	

Major Theory (Elective) 11 – Paleontology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119234	Paleontology	2	30	2 Hrs	30

Course Objectives:	• **To understand the principles of paleontology and the study of fossils as evidence of past life.** • **To learn the processes of fossil formation, preservation, and classification of major fossil groups.** • **To interpret the role of fossils in understanding Earth's history, evolution, and stratigraphy.**
Course Outcomes:	**After completing the course, the student will** 5. To improve the knowledge of fossils and its uses 6. Explain the characteristic features and classification of various phylum

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Paleontology: Introduction, branches, importance and scope. Fossils: definition, processes of fossilization, modes of preservation, significance of fossils, types of fossils – body fossils, plant fossils, trace fossils, index and zone fossils. Phylum Mollusca: characteristic features and classification. Class: Gastropoda, characteristic features, morphology of hard parts, ornamentation of shell. Tabular and systematic classification, Geological and geographical distributions.	8 Hrs	8 Marks	
Unit II	Class: Lamellibranchia or Bivalvia: characteristic features, morphology of hard parts, type of hinge lines and dentitions, ornamentation of shell. Tabular and systematic classification, Geological and geographical distributions. Class Cephalopoda: characteristic features, morphology of hard parts of Nautiloids, Ammonoids and Belemnites; type of suture lines, comparison between Nautiloids and Ammonoids. Tabular and systematic classification, Geological and geographical distributions.	7 Hrs	7 Marks	
Unit III	Phylum Brachiopoda: characteristic features, morphology of hard parts of class articulate and	8 Hrs	8 Marks	

	inarticulate. Types of brachial skeleton. Tabular and systematic Classification, Geological and geographical distributions. Phylum Echinodermata: Class Echinodea- characteristic features, morphology of hard parts of regularia and irregularia. Variations in the apical disc in echinoids. Tabular and systematic classification, Geological and geographical distributions.			
Unit IV	Phylum Arthropoda: Class Trilobita characteristic features, morphology of hard parts of trilobites, Tabular and systematic Classification, Geological and geographical distributions. Phylum Coelenterate: Class Anthozoa - characteristic features, madreporaria, polyp, medusa, types of septa. Tabular and systematic classification, Geological and geographical distributions.	7 Hrs	7 Marks	
References:	**Reference Books:** 1. M.A. Koregave (1998) Fundamentals of Invertebrate Palaeontology. Book World Enterprises, Mumbai. 2. Henry Woods (1985) Invertebrate Palaeontoogy. CBSPublishers. 3. R.C. Moore, C.G. Lalic Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical Major (Elective) – 16: Paleontology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119235	Paleontology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **Identification and study of common fossils and their morphological features.** • **Classification and drawing of major fossil groups (e.g., brachiopods, mollusks, foraminifera).** • **Interpretation of fossils for determining age and past environments of rock formations.**
Course Outcomes:	**After completing the course, the student will** **1**. fossil identification

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Detailed description including classification, characteristic features, age and sketch diagram of important fossils of different Phylums and classes (as in theory)	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I. Identification of fossils (20 fossil samples) 20 marks
II. Record 03 marks
III. Viva-voce 02 marks

Total – 25 marks

Major (Elevtive)Theory 11 – Environmental Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119236	Environmental Geology	2	30	2 Hrs	30

Course Objectives:	• **To understand the basic principles of environmental geology and Earth system processes affecting the environment.** • **To study natural hazards such as earthquakes, floods, landslides, and their impact on human life.** • **To develop awareness of environmental problems and sustainable management of geological resources.**
Course Outcomes:	**After completing the course, the student will** 3. Understand the basic idea about environment geology and natural hazards. 4. To improve the knowledge of Climate Change and global warming.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Definition, Scope and Basic concepts of Environmental Geology. Environment, Ecology, Ecosystems and habitat. Renewable and non-renewable natural resources. Role of geology in natural resources management and environmental planning. National Environmental Policy for air and water pollution. National Environmental Laws	8 Hrs	8 Marks	
Unit II	Landforms as ecosystem units. Characteristics of various environmental regimes – fluvial, coastal, marine, Aeolian, desert, and glacial. Understanding their causes, types, Mitigation and Management. Geomorphic controls on biodiversity and its conservation. Conservation of soil and water resources. Mitigation and Management. Draught and desertification, Measures of mitigation. Sea level changes. Measures of mitigation.	7 Hrs	7 Marks	
Unit III	Climate Change and global warming: Causes and Impact (Ozone layer depletion and ozone hole). Environment impact assessment report and preparation of environment Management plans. Geological hazards: Lands slides, Volcanic activity, Earthquake and Tsunami. Understanding their causes, types,	8 Hrs	8 Marks	
Unit IV	Geological hazards -River flooding, erosion and sedimentation, coastal erosion and cyclones. Surface and subsurface by mining activities. Human settlement and contamination of atmosphere, soil, surface water and groundwater by waste disposal and agro-industries.	7 Hrs	7 Marks	

References:

Reference Books:

1. Bryant, E. (1985): Natural Hazards, Cambridge Univ. Press.
2. Keller, E.A.(1978): Environmental Geology, Bell and Howell, USA.
3. Nagabhushaniah, H.S. (2001): Goundwater in Hydrosphere, CBS Publ.
4. Perry, C.T. and Taylor, K.G. (2006): Environmental Sedimentology, Blackwell Publ.
5. Singh, S. (2001): Geomorphology, Pustakalaya Bhawan, Allahabad.
6. Todd, D.K. (1995): Groundwater Hydrology, John Wiley and Sons.
7. Valdiya, K.S.(1987): Environmental Geology – Indian Context, Tata McGraw Hill.
8. Montgomery, C.W. Environmental Geology, Won. C. Brown, Publishers, Iowa, 1989.
9. Dorothy Merritts, Andrew de Wet, Kirsten Menking, Environmental Geology W. H. Freeman & Co. and Sumanas, Inc. USA, 1997

Weblink to Equivalent MOOC on SWAYAM if relevant:
Weblink to Equivalent Virtual Lab if relevant:
Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical 16– : Environmental Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119237	**Environmental Geology**	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **Identification and study of major environmental hazards such as floods, landslides, and earthquakes using maps and case studies.** • **Interpretation of topographic and geological maps for environmental analysis and land-use planning.** • **Basic study and reporting of soil, water, and pollution-related environmental issues.**
Course Outcomes:	**After completing the course, the student will** **1.** Chemical analysis of Water and Soil samples 2. Plotting the data / available geochemical data on variation diagrams 3. Preparation of map showing hazards like floods, landslide, earthquakes, rainfall patterns etc**.**

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
1. Collection of water and soil samples and their analysis using standard methods. 2. Plotting the produced data / available geochemical data of water and soil analysis will be plotted on Gibb's plot, Piper Trilinear Diagram and textural diagram respectively and their interpretations 3. Preparation of a hazards map of India including flood, landslide, earthquake, and rainfall patterns and discussion about their causes, effects, and mitigation with management 4. Preparation of different hazard zonation maps to understand the low-risk to high-risk regions with appropriate measures	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

i) Piper Trilinear Diagram and textural diagram respectively and their interpretations	07 marks
ii)Hazards map of India	06 marks
iii)Preparation of different hazard zonation maps	07 marks
Iv) Record	03 marks
v) Viva-voce	02marks

	Total – 25 marks

Minor Theory 5 – Indian Stratigraphy and Paleontology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119238	Indian Stratigraphy and Paleontology	2	30	2 Hrs	30

Course Objectives:	• **To understand the stratigraphic framework of India and the distribution of major rock systems.** • **To study important fossils of India and their role in age determination and correlation of strata.** • **To develop knowledge of geological history and evolution of the Indian subcontinent through stratigraphy and paleontology.**
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about Stratigraphy 2. Describe and interpret the various stratigraphical Supergroup and group 3. To improve the knowledge of fossils and its uses 4. Explain the characteristic features and classification of various phylum

Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Introduction- principles and importance. Stratigraphic classification: lithostratigraphic, chronostratigraphic and biostratigraphic units. Physiographical division of India, Geological time scale; Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Archaean Supergroup and Dharwar Supergroup	8 Hrs	8 Marks	

Unit II	Classification, geographic distribution, lithological characteristics, fossil content and economic importance of Cuddapah Supergroup; Vindhyan Supergroup, Deccan Trap and Gondwana Supergroup	7 Hrs	7 Marks	
Unit III	Paleontology: Introduction, branches, importance and scope. Fossils: definition, processes of fossilization, modes of preservation, significance of fossils, types of fossils – body fossils, plant fossils, trace fossils, index and zone fossils. Phylum Mollusca: characteristic features and classification. Class: Gastropoda, characteristic features, morphology of hard parts, ornamentation of shell. Tabular and systematic classification, Geological and geographical distributions. Class: Lamellibranchia or Bivalvia: characteristic features, morphology of hard parts, type of hinge lines and dentitions, ornamentation of shell. Tabular and systematic classification, Geological and geographical distributions.	8 Hrs	8 Marks	
Unit IV	Class Cephalopoda: characteristic features, morphology of hard parts of Nautiloids, Ammonoids and Belemnites; type of suture lines, comparison between Nautiloids and Ammonoids. Tabular and systematic classification, Geological and geographical distributions. Phylum Brachiopoda: characteristic features, morphology of hard parts of class articulate and inarticulate. Types of brachial skeleton. Tabular and systematic Classification, Geological and geographical distributions	7 Hrs	7 Marks	
References:	**Text books:** Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi. **Reference Books:** Ravindrakumar: Fundamentals of Historical Geology and Stratigraphy of India. Krishnan M.S.: Geology of India and Burma Wadia, D. N.: Geology of India. Deshpande G.G.: Geology of Maharashtra. Ramkrishnan and Vaidyanadhan: Geology of India, Volume I and II, Geological Society of India, Bangalore. M.A. Koregave (1998) Fundamentals of Invertebrate Palaeontology. Book World Enterprises, Mumbai. M.A. Koregave (1998) Fundamentals of Invertebrate Palaeontology. Book World Enterprises, Mumbai. Henry Woods (1985) Invertebrate Palaeontoogy. CBSPublishers. R.C. Moore, C.G. Lalic Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Minor Lab / Practical – 17: Indian Stratigraphy Paleontology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119239	**Indian Stratigraphy** Paleontology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **Identification and study of important Indian fossils and their morphological features.** • **Correlation of stratigraphic units using fossils and simple geological maps.** • **Preparation and interpretation of basic stratigraphic charts and fossil records.**
Course Outcomes:	**After completing the course, the student will** **1. Physiographic division of India** **2. Major stratigraphic division** **3. fossil identification**

Contents	Workload Allotted	Credit	Incorporation of Pedagogies
Physiographic division of India Exercises showing major stratigraphic divisions of India	**4 Hrs per**		

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Detailed description including classification, characteristic features, age and sketch diagram of important fossils of different Phylums and classes (as in theory)	**week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I.	Physiographic division of India with description	05 marks
II.	Major stratigraphic division with description	05 marks
III.	Identification of fossils	10 marks
IV.	Record	03 marks
V.	Viva-voce	02 marks
	Total –	25 marks

Vocational Skill Course Lab/Practical 18: Gemology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119240	Minerals and gems	2	60	3 Hrs	50

Course Objectives:	• **To identify and classify important gemstones based on their physical and optical properties.** • **To develop practical skills in gemstone examination, grading, and basic quality assessment.** • **To understand the occurrence, uses, and economic importance of gemstones in the gem and jewelry industry.**			
Course Outcomes:	**After completing the course, the student will** Learn the Importance, Application of Minerals and gems			
Unit System	**Contents**	**Workload Allotted**	**Credit**	**Marks and exam duration**
	Identification of various gemstones by their physical and optical properties using gemological instruments: **. Feldspar Group-** Orthoclase, Plagioclase, Albite, Moonstone, Labradorite, Amazonite, Sunstone.**Garnet Group-** Almandine, Pyrope, Grossular, Andradite, Spessartine, Uvarovite. **Corundum Group-** Ruby, Sapphire (Yellow, Blue, Pink varieties). **Beryl Group -**Emerald, Aquamarine, Heliodor, Morganite., **Quartz Group-** Rock Crystal, Amethyst, Citrine, Smoky Quartz, Rose Quartz, Aventurine Quartz, Quartz Cat's Eye, Chalcedony, Jasper. **Tourmaline Group-** Rubellite, Indicolite.**Organic Gemstones-** Amber, Coral, Pearl (Real and Cultured), Ivory, Wood Fossil.**Oxide and Silicate Gemstone -** Zircon, Spinel, Sphene (Titanite), Tanzanite (Zoisite variety), Zoisite, Kyanite, Epidote, Enstatite, Iolite.**Phosphate and Carbonate Minerals-**Turquoise, Malachite, Rhodochrosite, Calcite, Sodalite, Lapis Lazuli. **Other Gemstones / Varieties-** Peridot, Topaz, Fluorite (Fluorspar), Serpentine, Nephrite (Jade), Magnetite, Hematite, Sinhalite.	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**

Practical Internal
Activity

1. Perform any 5 experiment/model/ Map	30 Marks
2. Field work	10 Marks
3. Internal Viva	10 Marks

References:	1. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Skill Enhancement Course Lab/Practical 19: Tools and Techniques in Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	5	119241	Tools and Techniques in Geology	2	60	3 Hrs	50

Course Objectives:	1. Familiarize with basic geological tools and instruments such as hand lens, rock hammers, GPS, compass, and hardness kit. 2. Learn the use of the petrological microscope for mineral and rock identification. 3. Develop skills in geological mapping techniques, including field procedures and data collection. 4. Practice plotting field data and preparing geological maps using standard methods and equipment.
Course Outcomes:	**After completing the course, the student will** Learn the Importance, Application of Rainwater harvesting

Unit System	Contents	Workload Allotted	Credit	Marks and exam duration
	Hand Lens, Rock Hammers, Geological Compass, field books, Global Positioning System (GPS), Hardness Kit, Petrological Microscope, Geological mapping Techniques, Geological Mapping Procedure, Plotting of field data and preparation of Geological map and other geology field equipment's	**4 Hrs per week**	**2**	**Maximum Marks 50 Minimum Marks 20 Exam Duration 3 Hrs**

Practical Internal Activity

1. Perform any 5-experiment/model/ Map	30 Marks
2. Field work	10 Marks
3. Internal Viva	10 Marks
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	50 Marks

References:	1. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)

Geology FP/CEP- Project

Geology FP/CEP- Project -119242	
Field Project / CE Services in Geology: Phase-III	
Credits: 02	**Workload (Hrs./Week): 04**
Course Objectives:	11. To provide hands-on experience in applying theoretical geology knowledge to real-world challenges through field-based projects or community engagement (CE) services. 12. To train students in identifying, problems encountered in Geology and hydrology-related fieldwork or community service activities. 13. To encourage students to integrate geology and field geology concepts with interdisciplinary knowledge, technology, and societal needs. 14. To develop students' abilities to document, present, and communicate their field-based or community engagement work effectively to diverse audiences. 15. To instill a sense of responsibility and service by involving students in projects that address community issues related to science and technology.
Course Outcomes:	11. Students will be able to apply geology related analytical techniques to investigate and solve real-world problems in field settings. 12. Students will demonstrate proficiency in using experimental tools, instruments, and data analysis methods relevant to their field project or CE service. 13. Students will be able to design, plan, and execute a field geology project or community service activity from inception to completion, including documentation and reporting. 14. Students will effectively communicate their project findings and outcomes through written reports, presentations, or community engagement events. 15. Students will demonstrate an understanding of the ethical, environmental, and societal impacts of their work, showing a commitment to responsible scientific practice and

	community well being.
Guidelines/SOP for Selection and Implementation of Field Projects / CE Services	
1. Project Selection and Planning	• **Faculty Guidance:** Students will be assigned a faculty mentor to guide their project, providing expertise and resources. • **Project Topic:** The project topic should be relevant to Geology and align with the student's interests and the available resources. • **Literature Review:** Students are expected to conduct a thorough literature review to understand existing knowledge and identify research gaps. • **Data Collection and Analysis:** Projects often involve experiments, field sampling, simulations, or data analysis from existing sources, depending on the topic. • Project Timeline: The total time allocation for the student to carry out field project is 60 hours.
2. Data Analysis and Interpretation	• **Statistical Methods**: Students will learn and apply appropriate statistical methods to analyze data. • **Interpretation of Results:** Data should be interpreted within the context of the project, highlighting significant findings and limitations.
3. Report Writing and Presentation	• **Report Format**: A structured report format is usually followed, including an abstract, introduction, methodology, results, discussion, and conclusion. • **Data Presentation**: Data should be presented clearly and accurately using tables, graphs, and figures. • **Oral Presentation:** Students will be required to present their findings to peers and faculty.
4. CE Services (Community Engagement)	• **Community Needs**: Projects may focus on addressing specific community needs or challenges relevant to physics. • **Collaboration:** Students can collaborate with local organizations to implement their projects. • **Impact Assessment**: The impact of the project on the community should be evaluated**.**
5. Evaluation and Assessment	• **Project Report:** The final report will be assessed based on its content, organization, and the quality of the research. (20 Marks) • **Oral Presentation:** The presentation will be evaluated on clarity, engagement, and the ability to answer questions. (10 Marks) • **Faculty Evaluation:** The faculty mentor will assess the student's performance throughout the project. (20 Marks) • **Total 50 Marks**
Examples of Field Projects/CE Services in Physics	• **Environmental Geology**: Studying the impact of pollution on local ecosystems or developing renewable energy solutions. • **Hydrogeology**: Collect water sample in filed near college or village and analysis the water samples physical and chemical parameters and Investigating the effects of ground water • **Drainage Basin Analysis:** Mapping a drainage basin and analyzing its slope to understand geomorphic processes • **Community Outreach:** Organizing science workshops or engaging in scientific literacy initiatives. • **Research Project:** Study related to the subject that contribute to the advancement of knowledge and the well-being of life on Earth.

Note: The extended portion of the Field Project/CE Services in Geology from Phase-I may be carried forward as Field Project/CE Services in Geology: Phase-II in the fourth semester, subject to the approval of the assigned faculty mentor.

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

THIRD YEAR: SEMESTER – VI

Mode of Teaching	Ver. No	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major	Theory12	119243	Remote Sensing and GIS	2	2	18
			Theory13	119244	Hydrogeology	2	2	
			Theory14	119245	Mining Geology	2	2	
			Lab/Practical-20	119246	Hydrology and Remote Sensing and GIS	2	4	
		Major (Elective) Any one Elective group of Courses shall be opted	Theory3	119247	Petroleum and Coal Geology	2	2	
			Lab/Practical-23	119248	Petroleum and Coal Geology	2	4	
			Theory3	119249	Exploration Geology	2	4	
			Lab/Practical-23	119250	Exploration Geology	2	4	
			Theory3	119251	Micropaleontology and field geology	2	4	
			Lab/Practical-23	119252	Micropaleontology and field geology	2	4	
	b.	Minor	Theory8	119253	Structural and Tectonics	2	2	6
			Lab/Practical-24	119254	Structural and Tectonics	2	4	
	c.	Generic/ Open Elective	-			-	-	0
	d.	VSE/SEC	Lab/Practical-25	119255	Environmental Geology	2	4	4
	e.	VEC						
	f.	Internship / Apprenticeship	OJT			4	8	8
		FP/CES	Project			-	-	
		-	-	-	-	-	-	-
		TOTAL				**22**	**36**	**36**

Major Theory 10 – Remote Sensing and GIS

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119243	Remote Sensing and GIS	2	30	2 Hrs	30

Course Objectives:	• **Understand the principles and techniques of remote sensing, satellite imagery, and GIS for earth observation and spatial analysis.** • **Learn to acquire, process, and interpret geospatial data for geological, environmental, and resource applications.** • **Apply GIS and remote sensing tools for mapping, analysis, and decision-making in natural resource and environmental management.**
Course Outcomes:	**After completing the course, the student will** 1. Understand the principles of remote sensing and GIS, including satellite imagery, data acquisition, and spatial analysis. 2. Analyze and interpret geospatial data for applications in geology, environmental studies, and resource management. 3. Apply GIS and remote sensing tools for mapping, decision-making, and solving real-world geospatial problems.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Concept of remote sensing, types of remote sensing systems (active and passive), Elements of passive remote sensing system (data acquisition and data analysis); applications of remote sensing in studying the natural resources like minerals, ground water, soil and forests.	8 Hrs	8 Marks	
Unit II	Satellites and Satellite data - introduction and brief history, types of satellites, information obtained with reference to latest IRS & LANDSAT satellites. Sensors – types and their applications. Advantages and limitations of Remote Sensing	7 Hrs	7 Marks	
Unit III	Interpretation and advantages of Thermal imagery. Introduction, TIR region of electromagnetic spectrum, thermal properties of material. Introduction of Electromagnetic Spectrum. Application of Microwave Remote Sensing.	8 Hrs	8 Marks	
Unit IV	Introduction and components of GIS (geographical information system. Applications of GIS, (Geographical information system). Data formats- Raster and Vector. Spatial data models and data editing. Concept of Global positioning System (GPS) and its segments. Applications of Global positioning System(GPS)	7 Hrs	7 Marks	

References:	**Reference Books:** 1. Pande, S.N. (1987) Principles and Applications of Photogeology. Wiley Eastern Limited. 2. Sabisn, F.F. (2000) Remote Sensing Principles and Interpretations. W.H. Freeman and Company, USA 3. Lilesand, T.M. and Kiefer, R.W. (2000) Remote Sensing and Image Interpretation. John Wiley and Sons Inc.,New York. 3. Drury, S.A. (1997) Image Interpretaton in Geology. Chapman and Hall, London. 4. Dr.AFZAL An Introduction to Remote Sensing ;SHARIEFF ;Sarup book Publishers PVT.LTD. , New Delhi.
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Major Theory 11 – Hydrogeology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119244	Hydrogeology	2	30	2 Hrs	30

Course Objectives:	• **Understand the occurrence, movement, and storage of groundwater, including aquifer types and flow principles.** • **Learn techniques for groundwater exploration, well design, and sustainable water resource management.** • **Apply hydrogeological knowledge to analyze groundwater quality, assess availability, and solve practical water-related problems.**			
Course Outcomes:	**After completing the course, the student will** 1 Understand the basic idea hydrology. 2. Describe and interpret the various groundwater types and its properties 3. Acquire the knowledge of engineering properties of rocks			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Concept of hydrology, hydrogeology and ground water, Hydrologic cycle and its components, Occurrence and distribution of ground water, Water Table; Aquifer and its types – confined, unconfined and semiconfined. Properties of aquifer- porosity, permeability, specific yield, safe yields, storage coefficient, storativity and transmissivity.	8 Hrs	8 Marks	
Unit II	Recharge and discharge, Darcy's Law and its validity Cone of depression, Influent and affluent seepages, Springs and its types. Ground water Provinces of India. Groundwater and water quality services, Hydrochemical parameters of ground water (Acidity, Alkalinity, Hardness, pH, Conductivity). Recharge through wells and its types. Rain water harvesting.	7 Hrs	7 Marks	
Unit III	Physical and chemical qualities of ground water. Presentation of the results of chemical analysis. Diagrammatic representation of geochemical data. Quality standard of ground water in domestic, agriculture & industries. WHO standards for drinking water	8 Hrs	8 Marks	
Unit IV	Geophysical investigations for groundwater exploration. Geologic and hydrologic methods, Surface geophysical methods, Geophysical well logging.	7 Hrs	7 Marks	
References:	**Text books:** 1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina. 2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. 3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. **Reference Books:** 1. Todd, D.K. (1980) Ground Water Hydrology. John Wiley and Sons Inc. New York. 2. Karanth, K.R. (1989) Hydrogeology. Tata McGraw Hill Pub.Co.Ltd., New Delhi. 3. Nagabhushaniah, H.S. (2001) Groundwater in Hydrosphere (Groundwater Hydrology) CBS Publisher, New Delhi. 4. Karanth K.R. Groundwater, Assessment, Development and Management. Tata McGraw Hill Pub. Co. Ltd., New Delhi. 5. Raghunath: Ground Water Hydrology, New Age Publication, Pune. 6. P. Arul Murugan, R.R. Krishnamurthy, groundwater targeting and coastal hydrogeological studies"			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Major Theory 14 – Mining Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119245	Mining Geology	2	30	2 Hrs	30

Course Objectives:	• **To introduce the fundamental concepts of mining geology, including types of mineral deposits, ore genesis, and mining methods.** • **To develop an understanding of geological controls on ore bodies and their role in exploration and mine planning.** • **To provide knowledge of mining operations, resource evaluation, and environmental impacts associated with mining activities.**
Course Outcomes:	**After completing the course, the student will** 1. Understand the formation, classification, and distribution of mineral deposits, including ore genesis and associated geological processes. 2. Apply geological and exploration techniques to analyze, evaluate, and estimate ore reserves for mining feasibility. 3. Integrate geological knowledge to support mine planning, design, safety, and effective communication of findings.

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Definition of mining, Introduction, Application of rock mechanics in mining. Planning. Exploration and exploratory mining surface and underground mineral deposits,	8 Hrs	8 Marks	
Unit II	shaft sinking, drifting, cross cutting, winzing, stopping, room and pillaring, top slicing, sub level, caving & block caving. Types of drilling methods.	7 Hrs	7 Marks	
Unit III	Underground mining: Open Stopes: Gophering, Breast stoping, Open underhand stoping, Open overhand stoping, Underground glory hole, Pillar and chamber, Sub level method. Overhand Stoping-with suppurts: Timbered stopes (square set method), Filled stopes, Shrinkage stpes, Mitchell slicing system. Caving methods	7 Hrs	7 Marks	
Unit IV	Open cast mining or Quarrying: Loading by hand (manual))-general layout using: Trucks/Dumpers, Direct haulage, Aerial rope way. Loading by machines-general lay out using: Drag line, Power shovels, Scrapers, Land dredges, Over burden bridges, Bucket wheel, excavators, Conveyors (flight/belt). Spreaders, Glory hole, Kaolin mining	8 Hrs	8 Marks	

References:	**Text Books** Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical – 20: Hydrology and Remote Sensing and GIS

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119246	Hydrology and Remote Sensing and GIS	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To introduce the basic concepts of hydrology, including the hydrological cycle, surface water, and groundwater systems.** • **To develop skills in the use and interpretation of Remote Sensing and GIS data for studying water resources and environmental applications.** • **To provide fundamental understanding of spatial data analysis for mapping, monitoring, and managing hydrological and environmental features.**
Course Outcomes:	**After completing the course, the student will** 1. Plotting of groundwater table and groundwater provinces on outline map of India 2. Problems on determination of Aquifer Parameters.

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

	3. Interpretation of Aerial Photographs and Satellite Imageries.		
Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Plotting of Ground water provinces on outline map of India. Ground water table contour maps Problems on determination of Aquifer Parameters Interpretation of Aerial Photographs and Satellite Imageries Introduction to GIS software and basic interface (QGIS/ArcGIS). Importing and viewing base maps and satellite images. Digitization of simple features like points, lines, and polygons. Creation of a basic thematic map (e.g., land use or geology map). Basic map tools: measuring distance, area, and creating labels.	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.

Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I. Plotting of Ground water provinces on outline map of India.	04 Marks
II. Ground water table contour maps	04 Marks
III. Problems on determination of Aquifer Parameters.	04 Marks
IV Interpretation of Satellite Imageries	04 Marks
IV Field Work.	04 Marks
V Practical Record	03 Marks
VI Viva Voce	02 Marks
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	25 Marks

Major (Elective) Theory 15 – Petroleum and Coal Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119247	Petroleum and Coal Geology	2	30	2 Hrs	30

Course Objectives:	• **To introduce the fundamental concepts of petroleum and coal geology, including their origin, formation processes, and geological occurrence.** • **To understand the nature of petroleum systems and coal-bearing sequences, including source rocks, reservoirs, traps, and maturation processes.** • **To develop knowledge of exploration, evaluation, and economic significance of coal and petroleum resources.**			
Course Outcomes:	**After completing the course, the student will** 1. Students would be able to explain the basics concept Petroleum and caol its origin. 2. Students would be able to explain the hydrocarbon trap. 3. Students would be able to understand the importance of petroleum and coal.			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Petroleum: Origin and classification, chemical composition, Occurrence. Reservoir rocks: general attributes and petro-physical Properties. Reservoir rocks – petrology, porosity and permeability; Reservoir traps – structural, Stratigraphic and combination traps.	8 Hrs	8 Marks	
Unit II	Hydrocarbon traps: Definition classification of hydrocarbon traps (Structural, stratigraphic and combination), time of trap formation and time of hydrocarbon accumulation, Cap rock - definition and general properties. Oil reservoir fluids - water, oil and gas; Oil and source rock correlation. Migration of oil and gas: primary and secondary migration.	7 Hrs	7 Marks	
Unit III	Coal: Definition and origin of coal; Sedimentology of	8 Hrs	8 Marks	

	coal bearing strata. Rank, grade and type of coal. Indian and international classifications. Chemical analysis of coal. Physical properties of coal. Coal Petrology and its significance. Coal carbonization, coal gasification and coal hydrogenation.			
Unit IV	Coal bed methane: A new energy resource. Maturation of coal and generation of methane in coal beds. Coal forming epochs in the geological past. Coal as a source rock for oil and gas; Geological and geographical distribution of coal and lignite deposits in India; Gondwana coals - Classification, Conditions of deposition and petrography. Methods of coal prospecting and estimation of coal reserves. Uses of coal	7 Hrs	7 Marks	
References:	**Reference Books:** North, F.K. (1985): Petroleum Geology, Allen and Unwin. Taylor, G.H., Teichmuller, M., Davis, A., Diessel, C.F.K., Littke, R. and Robert, P., (1998): Organic Petrology, Gebruder, Borntraeger, Stuttgart. Chandra, D., Singh, R.M., and Singh, M.P., (2000): Textbook of Coal (Indian Context), Tara Book Agency, Varanasi. Singh, M.P. (Ed.), (1998): Coal and Organic Petrology, Hindustan Publ. Corp., New Delhi. Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical – 21: Petroleum and Coal Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119248	Petroleum and Coal Geology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To introduce the basic concepts of petroleum and coal geology, including their origin, occurrence, and geological significance.** • **To develop skills in identifying and interpreting subsurface data related to petroleum systems and coal-bearing strata.** • **To provide fundamental understanding of exploration, classification, and economic importance of fossil fuel resources.**
Course Outcomes:	**After completing the course, the student will** **1.** Learn the knowledge about coal identification **2.** Learn the knowledge Exercises on calculating coal reserves in a basin

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
Megascopic Identification: Identification of different varieties of coal (Peat, Lignite, Bituminous, Anthracite) based on physical properties. **Coal Petrography:** Identification of coal lithotypes (vitrain, clarain, durain, fusain) and macerals (vitrinite, inertinite, liptinite) under reflected light. **Reserve Estimation:** Exercises on calculating coal reserves in a basin	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I.	Megascopic identification of coal sample (06 samples)	12 marks
II.	Microscopic identification of coal (02 slide)	04 marks
III.	Exercises on calculating coal reserves	04 marks
IV.	Record	03 marks
V.	Viva-voce	02 marks
		Total – 25 marks

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Major (Elective) Theory 15 – Exploration Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119249	Exploration Geology	2	30	2 Hrs	30

Course Objectives:	• **To introduce the fundamental concepts, principles, and stages of mineral and hydrocarbon exploration.** • **To develop an understanding of exploration techniques, including geological, geophysical, and geochemical methods used in resource evaluation.** • **To provide knowledge of ore deposit models and the application of exploration strategies in identifying economically viable mineral resources.**
Course Outcomes:	**After completing the course, the student will** 1. Understand the basic idea about Exploration Geolog 2. Describe and interpret the various sampling techniques

Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
Unit I	Mineral resources. Resource reserve definitions. Mineral resources in industries - historical and present perspective. Prospecting and Exploration. Principles of mineral exploration: Prospecting and exploration conceptualization, methodology and stages.	8 Hrs	8 Marks	
Unit II	Sampling and sampling techniques. Geochemical exploration- nature of samples, anomaly, strength of anomaly and controlling factors; coefficient of aqueous migration. Introduction to geophysical methods of exploration Evaluation of data. Evaluation of sampling data. Mean, Mode, Median, Standard Deviation and Variance (symmetrical andnon symmetrical).	7 Hrs	7 Marks	
Unit III	Drilling and Logging. Core and non-core drilling. Planning of bore holes and location of boreholes on ground. Core-logging	8 Hrs	8 Marks	
Unit IV	Principles of reserve estimation, density and bulk density. Factors affecting reliability of reserveestimation. Reserve estimation based on geometrical models (square, rectangular, triangular and polygonblocks). Regular and irregular grid patterns, statistics and error estimation.	7 Hrs	7 Marks	

References:	**Reference Books:** Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Lab / Practical – 21: Exploration Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119250	Exploration Geology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To introduce basic concepts and methods of mineral and ore deposit exploration.** • **To develop skills in the use and interpretation of geological, geophysical, and geochemical data for resource exploration.** • **To provide fundamental training in identifying potential mineralization zones and understanding exploration techniques used in field studies.**
Course Outcomes:	**After completing the course, the student will**

Contents	Workload Allotted	Credit	Incorporation of Pedagogies
1. Identification of anomaly 2. Statistical analysis and graphical representation of data 3. Geological cross-section. 4. Reserve estimation. 5. Problems related with borehole and drilling data	**4 Hrs per week**	**2**	

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

i)	Statistical analysis and graphical representation of data	04 marks
ii)	Physical cross-section	04 marks
iii)	Reserve estimation problem	06 marks
iv)	Problems related with borehole and drilling data	06 marks
v)	Record	03 marks
vi)	Viva-voce	02 marks
		Total – 25 marks

Major (Elective) Theory 3 – Micropaleontology, Aerial geology and Field geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119251	Micropaleontology, Aerial Photo geology and Field geology	2	30	2 Hrs	30

Course Objectives:	• **To introduce the fundamental principles of micropaleontology, including the study, classification, and geological significance of microfossils.** • **To understand the role of microfossils in biostratigraphy, age determination, and reconstruction of past environments.** • **To develop basic knowledge and skills in field geology, including geological mapping, field observations, and interpretation of rock units and structures.**			
Course Outcomes:	**After completing the course, the student will** **1. fossil identification** **2.** Understand and use of basic tools for the fieldwork and describe the topographic Maps 3. Understand and use of Aerial Photo			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Modern field and laboratory techniques in the study of microfossils; Diatoms: Outline of morphology, classification and their significance in environmental study, paleolimnology, paleoceanography and economic geology; Brief introduction of Cyanobacteria, Calcareous nannofossils, Calcareous Algae, Phytoliths, acritarchs, Ostracoda, Spores/pollen and their significance in geosciences. Foraminifera: Outline morphology and their significance in paleoceanographic, paleoclimatic, paleobathymetric, biostratigraphy reconstructions; Types of organic matters.	8 Hrs	8 Marks	
Unit II	Aerial Photographs and its types, Satellite Imageries. Methods of studying aerial photographs in the form of Stereo-pairs and Mossaic. Pocket and Mirror stereoscope, Overlap and Sidelap, Drift and Crab.	7 Hrs	7 Marks	
Unit III	Elements of Photorecognition:- Tone, Texture, Shape, Size, Pattern, Scale of Photograph and Vertical exaggeration. Guidelines for Lithological, Structural and geomorphic interpretation. Applications of Photo geology	8 Hrs	8 Marks	
Unit IV	Field Geology: Significance of geological field work, Study of toposheet: numbering, latitude, longitude, scale and conventional sings. Surveying- various types, use and aim. Introduction to surveying equipment's.	7 Hrs	7 Marks	
References:	**Reference Books:** Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical – 21: Micropaleontology, Aerial geology and Field geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119252	**Micropaleontology,** Aerial geology and Field geology	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To introduce the basic concepts of micropaleontology, including the study and identification of microfossils and their geological significance.** • **To develop skills in recognizing common microfossil groups and understanding their role in stratigraphy, age determination, and paleoenvironmental reconstruction.** • **To provide basic training in field geology, including observation, recording of geological features, and interpretation of field data.**
Course Outcomes:	**After completing the course, the student will** **1. identification of microfossil** **2.** Reading of Topographic map

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
1. Detailed description including classification, characteristic features, age and sketch diagram of important fossils of different Phylums	**4 Hrs per week**	**2**	
Interpretation of Aerial Photographs and Satellite Imageries.			
Toposheets identification Toposheets: reading of toposheet with reference to toposheet number, latitude, longitude, state, district,scale, adjacent toposheet numbers and conventional signs.			

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

The Distribution of marks for Practical will be as follows.

I. Identification of fossils 05 marks
II. Interpretation of Aerial Photographs and Satellite Imageries. 10 marks
III. Toposheet reading and interpretation 05 marks
IV. Record 03 marks
V. Viva-voce 02 marks

Total – 25 marks

Minor Theory 6: Structural and Tectonic Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119253	Structural and Tectonic Geology	2	30	2 Hrs	30

Course Objectives:	• **To introduce the fundamental concepts of structural geology, including the study of rock deformation and geological structures such as folds, faults, joints, and unconformities.** • **To understand basic tectonic processes responsible for the formation and evolution of Earth's crust and major structural features.** • **To develop an elementary understanding of how structural and tectonic processes influence landforms, resources, and geological hazards.**
Course Outcomes:	**After completing the course, the student will** 2 Understand the basic idea about structure geology and plate tectonic. 5. Describe and interpret the various structure 6. To improve the knowledge of isostacy and plate tectonics

Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Attitude of bed. Clinometer and Brunton compass and its use, Outcrop in relation to topography and structure. Erosional structures – Unconformity: formation, types and recognition. Recognition of	8 Hrs	8 Marks	

	unconformities in field and map; Outlier-inlier, onlap, offlap, windows and klippe. Nappe			
Unit II	Stress and strain: definition and types; Interrelationship of Types of deformation plastics, elastic, brittle stress-strain and time, Mohr's Circle. Fold: Definition and terminology; classification – genetic and geometric; recognition of fold in field and map, causes of folding	7 Hrs	7 Marks	
Unit III	Faults: definition and terminology; classification of faults; causes of faulting, recognition of fault in field and map. Foliation and lineation – kinds and origin. Joints: definition and terminology; classification of joints; significance of joints.	8 Hrs	8 Marks	
Unit IV	Isostacy, Geosyncline - Definition, classification and evolution of mountains. Continental drift - evidences of drift. Plate tectonics - types of plate margins, causes of plate movement, evidences of plate tectonics. Sea floor spreading, Palaeomagnetism.	7 Hrs	7 Marks	
References:	**Reference Books:** Weblink to Equivalent MOOC on SWAYAM if relevant: Weblink to Equivalent Virtual Lab if relevant: Any pertinent media (recorded lectures, YouTube, etc.) if relevant:			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Lab / Practical – 22: Structural and Tectonic Geology

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	6	119254	**Structural and Tectonic Geology**	2	60	2 Hrs	25 (External) 25 (Internal)

Course Objectives:	• **To develop basic understanding of geological structures such as folds, faults, joints, and unconformities and their formation processes.** • **To train students in the identification and interpretation of structural features using maps, models, and field data.** • **To introduce basic concepts of tectonics and understand their role in shaping Earth's crust and landforms.**
Course Outcomes:	**After completing the course, the student will** **1.** Problems on Dip, Strike, Thickness of Beds and width of outcrop maps. 2. Section drawing and interpretation. 3. Morphometric Analysis**.**

Contents	**Workload Allotted**	**Credit**	**Incorporation of Pedagogies**
5. Use of Clinometer and Brunton compass 6. Outcrop- its true and apparent thickness, width of outcrop; problems on dip, strike, thickness of beds and width of outcrop (at least 10 problems) 7. Completion of outcrop - problems for conformable series and its structures (at least 05 maps). 8. Section drawing- Identification and interpretation of various landforms, geological successions, structures and geological history. Geological section drawing and interpretation for conformable series (at least 10 maps with different structures).	**4 Hrs per week**	**2**	

Practical Internal will have 25 Marks. Practical Internal examination will include class test, filed work, collection of samples etc.
Practical external Examination will be of 3 hours duration and Carry 25 Marks.

vi)	Problems on Dip, Strike, Thickness of Beds and width of outcrop maps (One problem)	05 marks
vii)	Completion of outcrop maps (One map)	05 marks
viii)	Section drawing and interpretation. (One section)	05 marks
ix)	Morphometric Analysis	05 marks
x)	Record	03 marks
xi)	Viva-voce	02marks
		Total – 25 marks

Skill Enhancement Course Lab/Practical 24: Mineral identification

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Mark
4.5	3	119255	Mineral identification	2	60	3 Hrs	50

Course Objectives:	• **To provide basic practical understanding of environmental geology, including rocks, soils, groundwater, and geological processes.** • **To develop skills in identifying and analyzing natural hazards and assessing their environmental impacts.** • **To create awareness about sustainable resource use and introduce basic Environmental Impact Assessment (EIA) concepts.**			
Course Outcomes:	**After completing the course, the student will** **a.** Learn the Importance, Application of Minerals and gems **b. Able to understand the basic of mineral identification.** **c. Learn the physical properties of minerals.**			
Unit System	**Contents**	**Workload Allotted**	**Credit**	**Marks and exam duration**
	Identification. Learn the physical properties of minerals. And group of minerals. Identification of minerals by following physical properties magnetism, electrical property, radio activity, & specific gravity. Identification of minerals by following physical properties luminescence (phosphorescence and Fluorescence), Identification of different group of Minerals	**4 Hrs per week**	**2**	**Maximum Marks 50** **Minimum Marks 20** **Exam Duration 3 Hrs**
Practical Internal Activity 1. Perform any 20 mineral samples 30 Marks 2. Field work 10 Marks 3. Internal Viva 10 Marks				
References:	**i.** Rutleys elements of Mineralogy : C.D.Gribble **ii.** A Textbook of Mineralogy : J.D.Dana **iii.** A Textbook of Geology: Dr. U.D. Kulkarni and Dr. I.A.Khan. (CHANGE THE BOOKS)			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			

Notes:

i. # Here mention the title of Degree. For example - Degree of Bachelor of Science with the Major Discipline / Subject Botany as Degree of Bachelor of Science (Botany)
j. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. However, for Music Discipline the batch size shall be of 7 students. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
k. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
l. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.
m. **Co-curricular Courses:** Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI**.** These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
n. Value Education Courses to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.

o. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University

p. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory : Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination and Assessment Process:

iv. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.

v. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.

vi. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination. Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in Teaching Learning Scheme prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table

Table: Examination, Evaluation and Assessment Scheme

Vertical No.	The Vertica	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
a	Maor	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	--	--	--	--	--	--
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
f	Internship/ Apprenticeship	Internal	Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process shall be prescribed separately											
	FP/CEP													
	CC													

Curriculum Design:

Each theory paper of Major shall be of 2 Credits comprising of 4 Units with Teaching Hours as mentioned in the table. The pattern of theory papers shall be as per following template –

The Curriculum of any Course shall be designed as per following template:

Course Objectives:				
Course Outcomes:	As per Blooms Taxonomy (4 to 6)			
Unit System	**Contents**	**Workload Allotted**	**Weightage of Marks Allotted**	**Incorporation of Pedagogies**
Unit I	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	BoS shall recommend suitable pedagogical strategies, both classical and contemporary innovations, for integration into the Teaching, Learning, and Evaluation (T, L, & E) Processes.
Unit II	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	

Scheme of Three-Year BSc Curriculum Delivery as per Uniform NEP 2020:

Unit III	Detailed pointwise contents with at least four points	8 Hrs	8 Marks	These strategies should be tailored to enhance the delivery and comprehension of the course content within each Unit, ensuring that they align with the educational objectives and learning outcomes.
Unit IV	Detailed pointwise contents with at least four points	7 Hrs	7 Marks	
References:	Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.			
Model Questions:	Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.			