॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Agriculture Microbiology	11	B.Sc. Physics
02	B.Sc. Botany	12	B.Sc. Seed Technology
03	B.Sc. Dairy Science	13	B.Sc. Horticulture
04	B.Sc. Electronics	14	B.Sc. Statistics
05	B.Sc. Environmental Science	15	B.Sc. Biochemistry
06	B.Sc. Fishery Science	16	B.Sc. Analytical Chemistry
07	B.Sc. Food Science	17	B.Sc. Agrochemical & Fertilizers
08	B.Sc. Geology	18	B.Sc. Industrial Chemistry
09	B.Sc./B.A. Mathematics	19	B.Sc. Industrial Microbiology
10	B.Sc. Microbiology		

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/११६
दिनांक ०५.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.

१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH

MARATHWADA UNIVERSITY, NANDED - 431 606

(**Structure and Syllabus of Four Years Multidisciplinary Degree Program with Multiple Entry and Exit Option**)

SECOND YEAR BACHELOR OF SCIENCE

Major in **Geology** Minor in **DSM (Geology)**

Under the Faculty of
Science and Technology

Effective from Academic year 2025 – 2026
(As per NEP-2020)

From Desk of Chairman, Board of Studies of the Subject Geology

Preamble:

Syllabus of Geology program offered by the Board of Study in Geology has been prepared as per the Credit Framework guidelines of National Education Policy (NEP) 2020 and considering the syllabi of the UPSC Geologists examination, MPSC examination, CSIR-NET examination and the requirements of the industry. The Geology is imparted to the students for four academic years consisting of eight semesters. Candidates will be examined and evaluated on grade basis at the end of each semester in different theory and practical papers as per the credits offered by each course.

The Geology program consists of Core Courses, Electives Courses, Minor Courses, Generic Elective Courses, Vocational & Skill Enhancement Courses, Research Methodology, Publication Ethics and Field Work/Training. This Four year UG program is of total 176 credits, with 22 credits for each semester.

In addition to class-room teaching and laboratory, the Geology program offers geological field training to the students. After completion of field training, students have to submit a filed report. Intensive On Job Training /Internships in the nationally reputed institutes shall also be provided to the Geology students. The semester breaks can also be utilized for the geological field training and internships.

Students will be assessed through Continuous Assessment (CA) and End Semester Assessment (ESA). Mode of Continuous Assessment (CA) will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting Two Tests (Test I on 40% curriculum) and Test II (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his CA score. The End Semester Assessment (ESA) (80% of the Maximum Marks) will be based on paper-pen pattern and laboratory experiments/calculations.

Every Geology student has to mandatorily submit dissertation thesis. The Research Project/Dissertation is of 6 Credits for Honors degree and 12 Credits for Research degree. The dissertation work is based on either new data generated for the proposed scientific problem *OR* based on available large global data sets using innovative ideas. The thesis should be based on sound methodology and well defined objectives. Through dissertation work the student should be well-versed with the literature on the chosen topic, independently define a scientific problem, carry out focused study on a research topic, analyze and interpret large data sets, independently write thesis / project proposal and present and defend the dissertation work. The Dissertation must be submitted by the end of fourth Semester with a Seminar presentation in the presence of faculty members, students and external examiners for the purpose of evaluation. The Geology students are strongly encouraged to publish their dissertation work in SCI journals.

Chairman, Board of Studies in Geology,

Swami Ramanand Teerth Marathwada University, Nanded.

Details of the Board of Studies Members in Geology under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr No	***Name of the Member***	***Designation***	***Address***	***Contact No.***
1	*Dr. Shaikh MD Babar,*	*Professor and Principal*	*DSM 's College of Arts, Commerce and Science College, Parbhani*	*9890184699*
2	*Dr. Hari Shankarrao Patode,*	*Associate Professor*	*School of Earth Sciences, S. R. T. M. University, Nanded*	*9850209045*
3	*Dr. Bhagwan Balasaheb Ghute,*	*Assistant Professor*	*Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist Hingoli.*	*9130006333*
4	Dr. Udaykumar Laxmikant Sahu,	***Assistant Professor***	***Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist Hingoli.***	***9860406757***
5	Prof. D. C. Meshram	***Professor***	***Department of Geology, S. P. Pune University, Pune***	***8275697166***
6	Dr. A. N. Dongre	***Associate Professor***	***Department of Geology, S. P. Pune University, Pune***	***9922410132***
7	Dr. Sukanta Roy	***Principal Scientist (F) & Project Director***	***BGRL, Ministry of Earth Sciences, Karad***	***9490469980***
8	Prof. A. R. Kulkarni	***Professor***	***SIBER, Kolhapur***	***7588470146***

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606

Summary of the Credits Assigned to various courses to be proposed by the Board of Studies under the Faculty of Science and Technology

A. No. Of Credits assigned to various courses:

Sr No.	Heads	Credits assigned in each Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Major Subject	4	4	8	8	16	16	18/14	18/14	92/84
2	Minor 1 Subject	4	4	4	4	--	--	--	--	16
3	Minor 2 Subject	4	4	--	--	--	--	--	--	08
3	Generic Electives / Research Methodology	2	2	2	2	--	--	4	--	8 + 4 (12)
4	Vocational and Skill Enhancement Course / Indian Knowledge System	2	2	2	2	4	2	--	--	8+6 (14)
5	Ability Enhancement Course L1 (English)	2	2	2	2	--	--	--	--	8
6	Ability Enhancement Course MIL (SL)	2	2	2	2	--	--	--	--	8
7	Value Added Course /IKS (Constitution of India / EVS)	2	2	--	2	--	--	--	--	6
8	Community Engagement Services NCC/NSS/Sports/Culture	--	--	2	--	--	--	--	--	2
9	Project/ Field Work/ OJT /Internship	--	--	--	--	2	4	--/4	4/8	10/12
10	Total Credits	22	22	22	22	22	22	22	22	176

1. **Major Courses *(92 / 84 credits, Basket-1)*:** Each BOS shall suggest **Major Courses** of 04 credits **(02 credit Theory and 02 credit practical papers)** for semesters III and IV

As the University has adopted Three Optional credit framework, therefore, every student have a freedom to chose three courses of his choice from among the options made available by a particular college / institute. As number of credits assigned to all the three optional are same, therefore, he / she have a freedom to select any one of them as Major and one as Minor course from second year onward.

2. **Minor Courses *(20 + 04 credits, Basket-2)*: Total numbers of credits assigned to the Minor Courses are 20** and a course on Research Methodology of 4 credits in VIIth semester.

[Note: *i.* Each Board of studies is required to develop curriculum of **two theory papers and a practical course each of 02 credits**. This would be **common for major and minor courses** during semesters I and II. **No need of preparing Minor courses separately for First Year**.

ii. Students have option to select any of the three optional as **Major** and one **Minor** at the beginning of the **Third Semester (Second Year)** of their degree programme.]

Each BOS shall suggest four Vocational and three Skill Enhancement Courses each of 02 credits to be offered.

3. Generic Electives *(10 credits; **for students from faculties other than Science and Technology, Basket-3**)*: One paper each of **02/04** credits **to be offered** in semester I to VI as Generic Electives. As these papers shall be opted by the students from other faculties; therefore, difficulty level of these courses shall at beginners' level (4.0). Each BOS shall suggest a minimum of one and a maximum of four Generic Elective papers to be offered during semesters I to VI. Students have freedom to choose one Generic Elective paper from Basket-3 (common for all faculties) in each semester, provided these GE courses are from other faculty.

4. Ability Enhancement Course (AEC) *(08 credits; **common for all faculty students, Basket-4**)*: One Language course each of 02 credits in the first four semesters.

L1 – First Language English (Compulsory for all disciplines) (02 credits each in semesters I and III)

L2 – Second Language (Students have option to choose second language from the **Language Basket-IV**) *(02 credits each in semesters II and IV)*

Vocational and Skill Enhancement Courses (VC/SC) (08 +06 credits, shall be related to the Major Course): in semesters I to VI. These courses shall be related to the **Major subject**.

1. **Exit Option after First year**

Indian Knowledge System (IKS) (Generic) ***(02 credits, common for all faculties, Basket-5)*:** Students have a freedom to choose a course on **Indian Knowledge System** of 02 credits from ***Basket-5*** and shall be common for the students from all faculties of study.

Value Education Courses (VEC) ***(04 credits, common and compulsory for all faculty students)*:** Students have to complete two Value Added courses each of 02 credits during semester V and VI and are compulsory for students of all faculties.

a. Constitution of India *(02 credits)* – in Semester V

b. Environmental Studies *(02 credits)* – in Semester VI

Community Engagement Services (CES / CCC)*(08 credits, common for all faculty students)*: Students need to complete four Community Engagement Services courses like NCC, NSS, Sports, Cultural Studies each of 02 credits in first four semesters I, II, III and IV and are common across the faculty.

Grades of NCC/NSS/Sports/Cultural courses shall be awarded to the students on the basis of their participation in University, Regional, National, International, Inter-University and Intra-University level activities. Guidelines for the award of grades for NCC/NSS/Sports/Cultural studies shall be prepared by a Committee constituted by the University.

Bachelor of Science in DSC Honors and Minor in DSM.

For the award of **Bachelor of Science in DSC Honors and Minor in DSM** students have to complete **92 credits** from Major, **20** credits of Minor and the required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

Bachelor of Science in DSC Honors with Research and Minor in DSM.

For the award of **Bachelor of Science in DSC Honors with Research and Minor in DSM** students have to complete **84 credits** theory courses of Major subject, **20 credits** of Minor and required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

These guidelines are as per the present instructions from Government of Maharashtra and are subject to change time-to-time as per the guidelines from Govt. of Maharashtra.

MULTIPLE EXIT Options for Students:

Field Work / Projects/ OJT/ Internship/Apprenticeship related to DSC major subjects *(14 credits for Honours and 22 credits for Honours with Research credits):* The students shall have to complete Field Work, Project, Case Study, Internship or Apprenticeship, etc. as per the credit framework.

Students may take exit after completion of first year with **Certificate in Major (DSC) and Minor (DSM) subject** on completion of minimum 44 credits and additional 4 credits of NSQF skill / vocational in major/minor subject or internship during summer vacation.

2. **Exit Option after Two years**

Students may take exit after completion of second year of the programme with **Diploma in Major (DSC) and Minor (DSM)** subject on completion of minimum 88 credits and additional 04 credits on NSQF skill / vocational or Internship on major/minor courses during summer vacation.

3. **Exit Option after Three years**

Students may take exit with a Degree as **Bachelors of Science in Major (DSC) and Minor (DSM)** after earning minimum of 132 credits.

4. **Exit Option after Four Years** after completing 176 credits

(a) Bachelor of Science in DSC Honours and Minor in DSM.

(b) Bachelor of Science in DSC with Research and Minor in DSM.

Swami RamanandTeerthMarathwada University, Nanded

Faculty of Science and Technology (Three Optional in the First Year)

Credit Framework for Four Year Multidisciplinary Degree Program with Multiple Entry and Exit

Subject: DSC (Major) /DSM (Minor 1)

Structure of Four Years Multidisciplinary Degree Program with Multiple Entry and Exit Option

B.Sc. Second year Subject: Geology

Year & Level	Semester	Optional 1 (Major) (From the same Faculty)	Optional 2 (Minor 1) (From the same Faculty)	Optional 3 (Minor 2) (From the same Faculty)	Generic Elective (GE) (select from Basket 3 of Faculties other than Science and Technology)	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Know-ledge System (IKS) (Basket 5) (Common across all faculties)	Field Work / Project /Internship/ OJT/ Apprentice-ship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) (Common across all faculties)	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	11
2 (5.0)	III	SGLGCT1201 (2cr) Optical Mineralogy and Dynamics of the Earth (Th) SGLGCT1202 (2cr) Palaeontology and Sedimentary petrology (Th) SGLGCP1201 (2cr) Practicals based on SGLGCT1201 SGLGCP1202 (2cr) Practicals based on SGLGCT1202 8 Credits	SGLGMT1201 (2cr) Physical Geology and Introduction to Fossils (Th) SGLGMP1201 (2cr) Practicals based on SGLGMT1201 (2T+2P) 4 Credits	--	SGLGGE1202 (2cr) The Earth as a Planet (Th) 2 Credits	SGLGSC1201 Water Quality Analysis (2cr) (Pr) Or Watershed Development (Pr) (2cr) 2 Credits	AECENG1201 (2Cr) (Compulsory English) AECMIL1201 (2Cr) (HIN,MAR,URD, etc) 4 Credits	CCCXXX1201 (2Cr) (NCC/NSS/SPT(sports)/ CLS(Cultural Studies)/HWS(Health Wellness)/ YGE (Yoga Education) / FIT(Fitness) 2 Credits	22	44

	IV	SGLGCT1251 (2cr) Structural Geology (Th) SGLGCT1252 (2cr) Igneous and Metamorphic Petrology (Th) SGLGCP1251(2cr) Practicals based on SGLGCT1251 SGLGCP1252 (2cr) Practicals based on SGLGCT1252 8 Credits	SGLGMT1251 (2cr) Introductory Structural Geology (Th) SGLGMP1251 (2cr Pr) Practicals based on SGLGMT1251 (2T+2P) 4 Credits	--	SGLGGE1251 Dynamic Geology (Th) (2cr) 2 Credits	SGLGSC1251 Completion of Geological maps from contour data (2cr) (Pr) OR Surveying and Leveling Methods (Pr) (2cr) 2 Credits	AECENG1251 (2Cr) (Compulsory English) AECMIL1251 (2Cr) (HIN,MAR,URD, etc) VECEVS1251 (2Cr) Environmental Studies 6 Credits	-- --	22	
	Cum. Cr.	16	8	0	4	4	10	2	44	
Exit option: UG Diploma in Major DSC and Minor DSM on completion of 88 credits and additional 4 credits NSQF / internship in DSC										

Basket 1: Major Subject Geology (8 Cr)

* Students will have to choose one subject from Basket 1 as a Major subject, from same faculty or other but other than DSC (in col. 3)

Semester	BOS proposing Major	Details of Major Subject	
		CODE	Title of the Corse
Semester III	BOS in Geology	SGLGCT1201 (2Cr) SGLGCP1201 (2Cr)	Optical Mineralogy and Dynamics of the Earth (Th) Practicals based on SGLGCT1201 (Pr)
		SGLGCT1202 (2Cr) SGLGCP1202 (2Cr)	Palaeontology and Sedimentary petrology (Th) Practicals based on SGLGCT1202 (Pr)
Semester IV	BOS in Geology	SGLGMT1251 (2Cr) SGLGMP1251 (2Cr)	Structural Geology (Th) Practicals based on SGLGCT1251 (Pr)
		SGLGMT1252 (2Cr) SGLGMP1252 (2Cr)	Igneous and Metamorphic Petrology (Th) Practicals based on SGLGCT1252 (Pr)

Basket 2: Minor Subject (4 Cr)

* Students will have to choose one subject from Basket 1 as a Minor subject, from same faculty or other but other than DSM (in col. 3)

Semester	BOS proposing Minor	Details of Minor Subject	
		CODE	Title of the Corse
Semester III	BOS in Geology	SGLGMT1201 (2Cr) SGLGMP1202 (2Cr)	Physical Geology and Introduction to Fossils ((Th) Practicals based on SGLGMT1201 (Pr)
Semester IV	BOS in Geology	SGLGMT1251 (2Cr) SGLGMP1252 (2Cr)	Introductory Structural Geology (Th) Practicals based on SGLGMT1251 (Pr)

Basket 3: Generic Elective course (GE)

Note: Each BOS shall suggest Generic Elective Courses for semesters III and IV
* Students will choose one GE course each from below (other than subjects DSC and DSM in col. 3 and 4).
(For e.g. As given in table below)

Semester	BOS proposing GE	Group A	
		CODE	Title of the Corse
Semester III	BOS in Geology	SGLGGE1201 (2Cr)	The Earth as a Planet (Th) (पृथ्वी : एक ग्रह)
Semester IV	BOS in Geology	SGLGGE1251 (2Cr)	Dynamic Geology (Th) (गतिक भूर्शास्त्र)

Basket 4: Skill Enhancement course (SC)

Note: Each BOS shall suggest Skill Enhancement Courses for semesters III and IV
* Students will choose one GE course each from below (other than subjects DSC and DSM).
(For e.g. As given in table below)

Semester	BOS proposing SEC/SC	Group A	
		CODE	Title of the Corse
Semester III	BOS in Geology	SGLGSC1201 (2Cr)	Water Quality Analysis (Pr) (2cr) OR Watershed Development (Pr) (2cr)
Semester IV	BOS in Geology	SGLGSC1251 (2Cr)	Completion of Geological maps from contour data (Pr) (2cr) OR Surveying and Leveling Methods (Pr) (2cr)

B. Sc. Second Year Semester III *(Level 5.0)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SGLGCT1201	Optical Mineralogy and Dynamics of the Earth (Th)	02	--	02	02	--
	SGLGCT1202	Palaeontology and Sedimentary petrology (Th)	02	--	02	02	--
	SGLGCP1201	Practicals based on SGLGCT1201 (Pr)	-	02	02	--	04
	SGLGCP1202	Practicals based on SGLGCT1202 (Pr)	-	02	02	--	04
Minor	SGLGMT1201	Physical Geology and Introduction to Fossils ((Th)	02	-	02	02	--
	SGLGMP1201	Practicals based on SGLGMT1201 (Pr)	-	02	02	--	04
Generic Electives	SGLGGE1201	Earth as a Plane	02	--	02	02	--
Vocational & Skill Enhancement Course	SGLGSC1201	Water Quality Analysis (Pr) (2cr) OR Watershed Development (Pr) (2cr)	--	02	02	--	04
Total Credits			08	08	18	08	16

B. Sc. Second Year Semester IV *(Level 5.0)*

Teaching Scheme

- [20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]
- (For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SGLGCT1251	Structural Geology (Th)	02	--	02	02	--
	SGLGCT1252	Igneous and Metamorphic Petrology (Th)	02	--	02	02	--
	SGLGCP1251	Practicals based on SGLGCT1251 (Pr)	-	02	02	--	04
	SGLGCP1252	Practicals based on SGLGCT1252 (Pr)	-	02	02	--	04
Minor	SGLGMT1251	Introductory Structural Geology (Th)	02	-	02	02	--
	SGLGMP1201	Practicals based on SGLGMT1251 (Pr)	-	02	02	--	04
Generic Electives	SGLGGE1251	Dynamic Geology	02	--	02	02	--
Vocational & Skill Enhancement Course	SGLGSC1251	Completion of Geological maps from contour data (Pr) OR Surveying and Leveling Methods (Pr) (2cr)	--	02	02	--	04
Total Credits			08	08	16	08	16

SGLGCT1201: Optical Mineralogy and Dynamics of the Earth (Th)
(Major 1) Curriculum Details Semester III

Course pre-requisite:

- The course is essential to have understanding of the basic Optical characters of minerals and to have basic information of Dynamics of the earth.

Course objectives:

- To acquaint the students with Optical Mineralogical applications in Geology.
- To study the dynamic processes of the earth, characters of earth's surfaces and their formations.

Course outcomes:

- Student will be able to know the fundamentals and identification of minerals under Microscope.
- The surface features of the earth depend on internal activities and behavior of magma. The knowledge of dynamic processes help in understanding the crustal dynamics of the earth.

Curriculum Details:(There shall be FOUR Modules in each course)
SGLGCT1201: Optical Mineralogy and Dynamics of the Earth (Th) (Major 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Optical Mineralogy-I	08
	1.1	Nature of Light, reflection, refraction, double refraction, total internal reflection and critical angle.	
	1.2	Nicol's prism, isotropism and anisotropism, isotropic and anisotropic minerals. Introduction to petrological microscope.	
	1.3	Position of extinction and extinction angle, Birefringence, refractive index, use of accessory plates, compensation and determination of interference colours,	
	1.4	Newton's scale, determination of sign of elongation where 'C' axis is known.	
2.0		Optical Mineralogy-II	07
	2.1	Vibration direction and optic orientation, anomalous colours, pleochroism and absorption.	
	2.2	Uniaxial and biaxial interference figures and determination of optic sign of uniaxial and biaxial minerals.	
	2.3	Methods of determination of refractive index: Becke line, Oblique illumination and liquid immersion method.	
	2.4	Study of Common optical properties of minerals.	
3.0		Dynamics of the Earth-I	07
	3.1	Isostasy: Concept and theories of Isostasy;	
	3.2	Concepts and classifications of Geosynclines	
	3.3	Theories of Continental drift and its evidences	
	3.4	Palaeomagnetism	
4.0		Dynamics of the Earth-II	08
	4.1	Evolution of plate tectonic theories, nature and types of plate margins.	
	4.2	Origin and significance of Mid-oceanic ridges.	
	4.3	Island arc and trenches.	
	4.4	Origin of oceans, continents, mountains and rift valleys	
		Total	30

Text Books & Reference Books:

1. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.

2. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill pub.

3. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co.

4. Flint, Y., 1975. Essential of crystallography, Mir Publishers.

5. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.

6. Stephen E. Keslerand Adam C. Simon (2015).Mineral Resources Economics and the Environment. Cambridge University Press.

7. Mehar D.N. Wadiya (2021). Minerals Of India. National Book Trust of India

8. W.H. Freeman & CoKerr, B.F., 1995. Optical Mineralogy 5th Ed. Mc Graw Hill, New York.

9. Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.

10. Gross, M. G. (1977). Oceanography: A view of the Earth.

11. Krishnan, M. S. (1982). Geology of India and Burma, C.B.S. Publishers, Delhi.

12. Holmes, A. (1945). Principles of Physical Geology. Thomas Nelson and Sons Ltd., London Edinburgh Paris Melbourne, Toronto and New York.

SGLGCP1201: Practicals based on SGLG CT1201

1) Study of Optical Properties of Following Minerals:

Quartz, Orthoclase, Microcline, Plagioclase, Augite, Hypersthene, Hornblende, Actinolite,

Olivine, Muscovite, Biotite, Garnet, Calcite, Chlorite, Kyanite, Sillimanite and Andalusite.

2) Newton's scale of interference colours,

3) Determination of sign of elongation of Minerals.

4) Determination of optic sign of uniaxial/biaxial minerals.

5) Reading of topographical maps (SOI).

6) Identification and description of Plate Margins in the given diagram/Map.

SGLGCT1202: Palaeontology and Sedimentary petrology (Th)
(Major 1) Curriculum Details Semester III

Course pre-requisite:

- The course is essential to have understanding of the basic paleontology for studying the palaeo-
- environment and ecology along with the processes of formation, mineral composition and structures
- of rocks due to various sedimentary processes.

Course objectives:

- To understand the evolution, preservation of ancient life on the earth surface.
- To study the sedimentary rocks in detail.

Course outcomes:

- Student will be able to understand the palaeo-environment and ancient life during the earth history in the study of Paleontology.
- Student will be able to understand the surface and sub surface processes of formation, mineral composition and structures of sedimentary rocks due to various processes.

Curriculum Details:(There shall be FOUR Modules in each course)
SGLGCT1202: Palaeontology and Sedimentary petrology (Th) (Major 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Palaeontology -I	08
	1.1	Definition and scope of palaeontology.	
	1.2	Geological Time Scale and evolution of life	
	1.3	Processes of fossilization and modes of preservation.	
	1.4	Elementary ideas about origin of life, evolution and fossil record.	
2.0		Palaeontology -II	07
	2.1	Systematic classification, their morphological characters and geological distribution of phylum Arthropoda (Trilobites),	
	2.2	Systematic classification, their morphological characters and geological distribution of phylum Mollusca (Class: Lamellibranch, Gastropod and Cephalopod)	
	2.3	Systematic classification, their morphological characters and geological distribution of phylum Brachiopods	
	2.4	Systematic classification, their morphological characters and geological distribution of phylum Echinodermata.	
3.0		Sedimentary petrology -I	07
	3.1	Formation of sediment and sedimentary rocks.	
	3.2	Different types of depositional environment such as terrestrial and marine environment. Mineral composition of sedimentary rocks.	
	3.3	Textural characters such as grain size, sphericity, roundness and shape.	
	3.4	Mechanical, chemical and organic structures. Maturity of sediments. Heavy Minerals.	
4.0		Sedimentary petrology -II	08
	4.1	Introduction, mineralogy, texture, structure, classification and economic importance of conglomerate	
	4.2	Introduction, mineralogy, texture, structure, classification and economic importance of sandstones and shale.	
	4.3	Introduction, mineralogy, texture, structure, classification of limestones.	
	4.4	Study of common sedimentary rocks.	
		Total	30

Text Books & Reference Books:

1. Shrock, R.R. and Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology, CBS Publ.

2. Swinerton, H.H., 1961. Outlines of Paleontology, Edward Arnold Publishers

3. Jain, P.C. & Anantharaman, M.S.,1983. Paleontology: Evolution and Animal Distribution. Vishal Publisher.

4. Lehmann, U., 1983. Fossil Invertebrate; Cambridge Univ. Press.

5. Principles of Petrology. Methuren and Co (Students ed.).

6. Ehlers, WG, and Blatt, H., 1987. Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers

7. Friedman & Sanders, 1978. Principles of Sedimentology. John Wiley and sons.

8. Pettijohn, F.J., 1975. Sedimentary rocks, Harper & Bros. 3rd Ed.

9. Prasad, C., 1980. A text book of sedimentology. CBS Publ.

10. Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.

SGLGCP1202: Practicals based on SGLG CT1202

1. Describe classification morphological characters and geological distribution of Shells/fossils.

2. Study of Following Sedimentary Rocks in Hand Specimen:
   Sandstone and its types, Grit, Carbonaceous Shale, Fossiliferous Limestone, Shelly Limestone, Breccia, Marl, Mudstone, Greywacke, Conglomerate, Arkose, Quartzite.

3. Study of the Optical Properties of Following Sedimentary Rocks :
   Sandstone, Limestone, Breccia, Conglomerate, Oolitic limestone, Fossiliferous limestone, Quartzite, Shale. Quartzite.

4. Study of Texture/structures of Sedimentary Rocks in hand specimen.
   Clastic, massive, textures, pisolitic, concretionary, graded bedding, ripple mark, mottled structures.

SGLGCT1251: Structural Geology (Th)

(Major 1) Curriculum Details Semester IV

Course pre-requisite:

- The paper is designed in order to understand the major structures in the crust and deformation behavior of rocks.

Course objectives:

- To study the structural characters of the crust
- To study origin and occurrence of major structures.
- To understand the mechanism of the evolution of rock structures and its application in the field.

Course outcomes:

- The study of structures helps in understanding the process of deformation of rocks and dynamic history of the region
- Student will be able to understand the surface and sub surface processes of formation structures of due to various deformational activities.

Curriculum Details:(There shall be FOUR Modules in each course)
SGLGCT1251: Structural Geology (Th) (Major 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Structural Geology -I	08
	1.1	Introduction, Attitude of beds, strike and dip, etc.	
	1.2	Study of clinometers compass, Brunton compass and its application in the field survey.	
	1.3	Determination of top of beds by using primary structures.	
	1.4	Fold: Parts of fold, nomenclature of folds, plunge of folds, types of fold and field study of folds.	
2.0		Structural Geology -II	07
	2.1	Fault: General characteristic of fault, types of movement.	
	2.2	Classification of fault based on geometry, genetic and net slip.	
	2.3	Attitude of faults relative to attitude of beds, fault pattern and value of dip of fault.	
	2.4	Criteria for recognition of fault in field such as discontinuity of strata, repetition and omission of beds, feature characteristic of fault plane surface and physiographic criteria.	
3.0		Structural Geology -III	08
	3.1	Joint: Introduction, Genetic and geometric classification of joints.	
	3.2	Unconformity: Introduction, general significance of unconformity	
	3.3	Types of unconformities such as disconformities, angular unconformity, non-conformity and local unconformity.	
	3.4	Overlap, off lap, overstep, outlier and inlier.	
4.0		Structural Geology -IV	07
	4.1	Distinction between unconformities and fault.	
	4.2	Lineation: Introduction, descriptive terminology, kinds, origin and relation to the major structures.	
	4.3	Foliation: Introduction, descriptive terminology, kinds, origin and relation to the major structures.	
	4.4	Schistosity: In relation with lineation and foliation.	
		Total	30

Text Books & Reference Books:

1. Billings, M.P., 1972. Structural Geology. Prentice Hall.

2. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley

3. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.

4. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.

5. Ghosh, S. K. (2013) Structural geology: fundamentals and modern developments. Elsevier.

6. Haakon Fossen (2010) Structural Geology. Cambridge University Press.

7. Jain, A.K. (2014) An introduction to structural geology. Text Book series in Geological Sciences for Graduate Students. Geological Society of India, Bangalore

8. Ramsay, J.G. (1967) Folding and fracturing of rocks. McGraw-Hill, New York

9. Roy, Asit K. (1966) Introduction to the study of geological maps. World Press Private Limited.

SGLGCP1202: Practicals based on SGLG CT1202

1) Study of Geological Maps Covering horizontal and inclined beds.

2) Study of Structural Geological Maps Covering Folds and Faults.

3) Study of Structural Geological Maps Covering Unconformity, Sill and Dykes.

4) Orthographic Methods of Solving Structural Problems.

5) Stereographic Methods of Solving Structural Problems.

6) Preparation of Geological report based on field tour of four days duration.

SGLGCT1252: Igneous and Metamorphic petrology (Th)

(Major 1) Curriculum Details Semester IV

Course pre-requisite:

- The course is essential to have understanding of the basic of petrology for studying the processes of
- formation, mineral composition and structures of rocks due to igneous and metamorphic processes.

Course objectives:

- To study the origin and formation of igneous rocks.
- To study the metamorphic rocks in detail.

Course outcomes:

- Student will be able to understand the surface features of the earth depend on internal activities and behaviour of magma.
- Student will be able to understand the surface and subsurface processes of formation, mineral composition and structures of metamorphic rocks due to various agents of metamorphism.

Curriculum Details:(There shall be FOUR Modules in each course)
SGLGCT1252: Igneous and Metamorphic petrology (Th) (Major 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Igneous Petrology -I	07
	1.1	Formation of glass and crystal.	
	1.2	Crystallization of unicomponent magma.	
	1.3	Crystallization of binary magma, eutectics and mixed crystals.	
	1.4	Crystallization of Ternary magma. Reaction relation and Bowen's reaction series.	
2.0		Igneous Petrology -II	08
	2.1	Textural characters such as granularity, shape of the crystal, mutual relation of crystals, textures and their types.	
	2.2	Microstructures and structures of igneous rocks. Classification of igneous Rocks.	
	2.3	Theories of differentiation and assimilation.	
	2.4	Crystallisation of Granitic and Basaltic magma. Study of common igneous rocks.	
3.0		Metamorphic Petrology -I	08
	3.1	Agents and kinds of metamorphism. Concept of depth zones and grades of Metamorphism.	
	3.2	Metamorphic facies and Eskola's concept of metamorphic facies. Pressure-Temperature Diagram.	
	3.3	Metamorphic minerals (stress and antistress minerals)	
	3.4	Texture and structure of metamorphic rocks.	
4.0		Metamorphic Petrology -II	07
	4.1	Process of formation of metamorphism such as cataclastic, thermal, dynamothernmal, plutonic metamorphism and their products.	
	4.2	Metasomatism, pneumatolytic metamorphism, injection metamorphism and Auto-metamorphism.	
	4.3	Lit-per-lit gneiss, composite gneiss. Anatexis and palingenesis.	
	4.4	Study of common metamorphic rocks.	

Text Books & Reference Books:

1. Turner, F.J. & Verhoogen, J., 1960, Igneous & Metamorphic petrology. McGraw Hill Co

2. Moorhouse, WW., 1969. The study of rocks in thin sections. Harper and sons.

3. Turner, F.J., 1980. Metamorphic petrology. McGraw Hill.

4. Mason, R., 1978. Petrology of Metamorphic Rocks. CBS Publ.

5. Tyrell, G. W., 1989. Introduction to petrology. World press 3.

6. Best, M. G. Igneous and Metamorphic Petrology, 2nd Edn., Blackwell, 2003

7. Blatt H., Tracy R.J. and Owens B.E. (2006) Petrology – Igneous, sedimentary and metamorphic rocks (3rd Edition), W.H. Freeman and Company, New York.

8. Bose M.K. (1997) Igneous Petrology. The World Press Pvt. Ltd. 568 p.

9. Philpotts, A. and Ague, J. (2009). Principles of igneous and metamorphic petrology. Cambridge University Press.

10. Raymond, L. A. (2002). Petrology: the study of igneous, sedimentary, and metamorphic rocks. McGraw-Hill Science Engineering

SGLGCP1202: Practicals based on SGLG CT1202

1) Study of Following Igneous Rocks in Hand Specimen:
   Porphyritic Granite, Granite, Nephilian syenite, Norite, Felsite, Peridotite Graphic granite, Obsidian, Granodiorite, Gabbro, Dunite Rhyolite, Trachyte, Andesite, Identification of various types of Basalts.

2) Study of the Optical Properties of Following Rocks:
   Granite, Syenite, Diorite, Gabbro, Rhyolite, Trachyte, Andesite and Basalt

3) Study of texture and structures of Igneous Rocks in hand specimen:
   Aphenitic, Glassy, Granitic, porphyritic, intergrowth textures; vesicular, amygdaloidal, ropy lava structures

4) Study of Following Metamorphic Rocks in Hand Specimen:
   Marble, Mica-Garnet schist, Actinolite schist, Sillimanite Schist, Gneisses, Granulite, Eclogite, Schorl, Amphebolite.

5) Study of the Optical Properties of Following metamorphic Rocks:
   Marble, Mica-Garnet schist, Actinolite schist, Sillimanite Schist, Trimolite Schist, Augen Gneiss, Granulite. Schorl, Eclogite

6) Study of structures of Metamorphic Rocks in hand specimen.
   Slaty cleavage, granulose, schistose, saccaroidal, mosaic, gneissose, augen gneissose structures

SGLGMT1201: Physical Geology and Introduction to Fossils ((Th)

(Minor 1) Curriculum Details Semester III

Course pre-requisite:

- The course paper is essential to have the understanding of the surface features of the Earth and evolution and classification of plant and animal kingdom.

Course objectives:

- To acquaint the students with physical process of the earth and shaping of its landforms.
- To understand the evolution, preservation of ancient life on the earth surface.

Course outcomes:

- Student will be able to understand the surface features of the earth through physical geology is useful for exploring the earth surface features by atmospheric agents
- Student will be able to understand the studying the palaeo-environment, life and ecological characteristics of the earth during past.

Curriculum Details:(There shall be FOUR Modules in each course)

SGLGMT1201: Physical Geology and Introduction to Fossils (Th) (Minor 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Physical Geology -I	07
	1.1	Geological processes such as erosion, transportation and deposition	
	1.2	Characteristics of Geological agents of erosion	
	1.3	Process of formation soil and soil profile	
	1.4	Study of various erosional and depositional features resulting from the action of: River.	
2.0		Physical Geology -II	08
	2.1	Study of various erosional and depositional landforms resulting from the action of: Wind.	
	2.2	Study of various erosional and depositional landforms resulting from the action of: Glaciers.	
	2.3	Study of various erosional and depositional landforms resulting from the action of: Sea.	
	2.4	Features formed due to mountain building activity.	
3.0		Introduction to Fossils -I	08
	3.1	Definition and scope of palaeontology.	
	3.2	Geological Time Scale.	
	3.3	Processes of fossilization and modes of preservation of fossil. Elementary ideas about origin of life, evolution and fossils.	
	3.4	Systematic classification of organisms, their morphological characters and geological distribution of Mollusca (Lamellibranch, Gastropod and Cephalopod),	
4.0		Introduction to Fossils -II	07
	4.1	Systematic classification of organisms, their morphological characters and geological distribution of Brachiopods.	
	4.2	Systematic classification of organisms, their morphological characters and geological distribution of phylum Echinodermata.	
	4.3	Systematic classification of organisms, their morphological characters and geological distribution of phylum Arthropoda (Trilobites).	
	4.4	Classification, their morphological characters and geological distribution of phylum Coelenterate (Graptolites).	
		Total	30

Text Books & Reference Books:

1. Arthur Holmes, 1992. Principles of Physical Geology. Chapman and Hall, London.

2. Miller, 1949. An Introduction to Physical Geology. East West Press Ltd.

3. Spencer, E.V., 1962. Basic concepts of Physical Geology. Oxford and IBH.

4. Mahapatra, G.B., 1994. A text book of Physical geology. CBS Publishers.

5. Shrock, R.R. and Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology, CBS Publ.

6. Swinerton, H.H., 1961. Outlines of Paleontology, Edward Arnold Publishers

7. Jain, P.C. & Anantharaman, M.S.,1983. Paleontology: Evolution and Animal Distribution. Vishal
   Publisher.

8. Lehmann, U., 1983. Fossil Invertebrate; Cambridge Univ. Press.

SGLGMP1201: Practicals based on SGLG MT1201

1. Reading of topographical maps (SOI).

2. Identification of geological features of erosional or depositional activity through models.

3. Describe classification morphological characters and geological distribution of Shells.

4. Describe classification morphological characters and geological distribution of fossils.

5. Geological Field Work (Three Days)

SGLGMT1251: Introductory Structural Geology ((Th)

(Minor 2) Curriculum Details Semester IV

Course pre-requisite:

- The course paper is essential to have the understanding of the surface features of the Earth and evolution and classification of plant and animal kingdom.

Course objectives:

- To acquaint the students with physical process of the earth and shaping of its landforms.
- To understand the evolution, preservation of ancient life on the earth surface.

Course outcomes:

- Student will be able to understand the surface features of the earth through physical geology is useful for exploring the earth surface features by atmospheric agents
- Student will be able to understand the studying the palaeo-environment, life and ecological characteristics of the earth during past.

Curriculum Details:(There shall be FOUR Modules in each course)

SGLGMT1251: Introductory Structural Geology (Th) (Minor 2)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Structural Geology -I	08
	1.1	Introduction, Attitude of beds, strike and dip, etc.	
	1.2	Study of clinometers compass, Brunton compass and its application in the field survey.	
	1.3	Determination of top of beds by using primary structures.	
	1.4	Fold: Parts of fold, nomenclature of folds, plunge of folds, types of fold and field study of folds.	
2.0		Structural Geology -II	07
	2.1	Fault: General characteristic of fault, types of movement.	
	2.2	Classification of fault based on geometry, genetic and net slip.	
	2.3	Attitude of faults relative to attitude of beds, fault pattern and value of dip of fault.	
	2.4	Criteria for recognition of fault in field such as discontinuity of strata, repetition and omission of beds, feature characteristic of fault plane surface and physiographic criteria.	
3.0		Structural Geology -III	08
	3.1	Joint: Introduction, Genetic and geometric classification of joints.	
	3.2	Unconformity: Introduction, general significance of unconformity	
	3.3	Types of unconformities such as disconformities, angular unconformity, non-conformity and local unconformity.	
	3.4	Overlap, off lap, overstep, outlier and inlier.	
4.0		Structural Geology -IV	07
	4.1	Distinction between unconformities and fault.	
	4.2	Lineation: Introduction, descriptive terminology, kinds, origin and relation to the major structures.	
	4.3	Foliation: Introduction, descriptive terminology, kinds, origin and relation to the major structures.	
	4.4	Schistosity: In relation with lineation and foliation.	
		Total	30

Text Books & Reference Books:

1. Billings, M.P., 1972. Structural Geology. Prentice Hall.

2. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley

3. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.

4. Singh, R. P., 1995. Structural Geology, A Practical Approach. Ganga Kaveri Publ., Varanasi.

5. Ghosh, S. K. (2013) Structural geology: fundamentals and modern developments. Elsevier.

6. Haakon Fossen (2010) Structural Geology. Cambridge University Press.

7. Jain, A.K. (2014) An introduction to structural geology. Text Book series in Geological Sciences for Graduate Students. Geological Society of India, Bangalore

8. Ramsay, J.G. (1967) Folding and fracturing of rocks. McGraw-Hill, New York

9. Roy, Asit K. (1966) Introduction to the study of geological maps. World Press Private Limited.

SGLGMP1251: Practicals based on SGLG MT1251

1) Study of Structural Geological Maps Covering horizontal and inclined beds.

2) Study of Structural Geological Maps Covering Folds and Faults.

3) Study of Structural Geological Maps Covering Unconformity, Sill and Dykes.

4) Orthographic Methods of Solving Structural Problems.

5) Stereographic Methods of Solving Structural Problems.

SGLGGE1201: Earth as a Planet ((Th)

(Generic Elective 1) Curriculum Details Semester III

Course pre-requisite:

- The course paper is essential to have the understanding of the surface features of the Earth and its evolution in solar system.

Course objectives:

- To study the internal and external zones of the earth.
- To study some of the dynamic processes related to earth.

Course outcomes:

- Student will be able to understand the surface features, relief features and external spheres of the earth.
- Student will be able to understand the earth by studying the age, theories of origin of the earth.

Curriculum Details:(There shall be FOUR Modules in each course)

SGLGGE1201: Earth as a Planet (Th) (Generic Elective 1)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Earth as a Planet -I	07
	1.1	Introduction to Earth Sciences	
	1.2	Scope of Geology	
	1.3	Earth in Solar System	
	1.4	Size, Shape, Mass, density of the earth.	
2.0		Origin and age of the Earth -II	08
	2.1	Grouping of Planets	
	2.2	Origin of the Earth	
	2.3	Age of the Earth	
	2.4	Rotation and revolution of the earth.	
3.0		**Relief and Interior of the Earth -III**	08
	3.1	Introduction to relief features of earth	
	3.2	Types of relief features – Mountains, Plateau, and Plain	
	3.3	Types of relief features – Valleys, basin and oceans	
	3.4	Internal Structure of the Earth: crust, mantle, and core	
4.0		**External Spheres of the earth -IV**	07
	4.1	Introduction to atmosphere	
	4.2	Introduction to hydrosphere	
	4.3	Introduction to biosphere	
	4.4	Elemental abundance in each sphere constituent	
		Total	30

Text Books & Reference Books:

1. Arthur Holmes, 1992. Principles of Physical Geology. Chapman and Hall, London.

2. Miller, 1949. An Introduction to Physical Geology. East West Press Ltd.

3. Spencer, E.V., 1962. Basic concepts of Physical Geology. Oxford and IBH.

4. Mahapatra, G.B., 1994. A text book of Physical geology. CBS Publishers.

5. Mahapatra, G.B., (1994) A text book of Physical Geology. CBS Publishers

6. Press and Siever (1998) Understanding Earth, WH Freeman & Co.

SGLGGE1251: Dynamic Geology ((Th)

(Generic Elective 2) Curriculum Details Semester IV

Course pre-requisite:

- The course paper is essential to have understanding basic information of structure and dynamic nature of earth.

Course objectives:

- To impart the basic ideas of earthquake and volcanoes on the earth.
- To study some of the dynamic processes related to earth.

Course outcomes:

- Dynamic Geology basics of the Earth are essential to understand the dynamicity of the Earth.

Curriculum Details:(There shall be FOUR Modules in each course)

SGLGGE1201: Dynamic Geology (Th) (Generic Elective 2)

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Dynamic Nature of the Earth -I**	07
	1.1	Earth as a dynamic system	
	1.2	Concept of Isostasy.	
	1.3	Pratt's and Airy's hypothesis of Isostasy	
	1.4	Formation of mountains and plains	
2.0		Earthquake -II	08
	2.1	Introduction to Earthquake	
	2.2	Causes of Earthquake	
	2.3	Types of Earthquake waves	
	2.4	Effects of Earthquake and their global distribution	
3.0		**Volcanoes -III**	08
	3.1	Introduction to volcanoes	
	3.2	Types of volcanoes and volcanic eruptions	
	3.3	Causes and effects of volcanoes.	
	3.4	Global distribution of volcanoes	
4.0		**Continental drift and Plate tectonics-IV**	07
	4.1	Introduction to continental drift and Sea-floor spreading	
	4.2	Mid-oceanic ridges, Trenches, island arcs and volcanic arcs.	
	4.3	The concept of Plate Tectonics.	
	4.4	Nature and types of Plate Margins/ boundaries	
		Total	30

Text Books & Reference Books:

1. Kearey, P., Klepeis, K. A., & Vine, F. J. (2009). Principles of Plate Tectonics. Wiley Blackwell.
2. Grotzinger, J., & Jordan, T. H. (2010). Understanding Earth. 6th Edn., W. H. Freeman and Company.
3. Mathur, S.M., (2003). Physical geology of India, National Book Trust, India, 222p.
4. Patwardhan ,A.M. (2011) The Dynamic Earth: System and Processes, PHI Learning Pvt. Ltd.,360p
5. Plummer, C. C., Carlson, D. H., & Hammersley, L. (2018). Physical Geology. 16th Edn., McGraw-Hill Education.
6. Philip Kearey, Keith A. Klepeis, and Frederick J. Vine (2009). Global Tectonics, 3rd Edition, Wiley-Blackwell,496p.
7. John J.W. Rogers and M. Santosh (2004). Continents and Supercontinents, Oxford University Press,304p. 11. Richard E. Ernst (2014)Large Igneous Provinces , Cambridge University Press,770p

Vocational and Skill Enhancement Courses (SEC)

Curriculum Details:*(There shall be FOUR Modules in each course)* Semester III

SGLGSC1201: Water Quality Analysis (Pr) (2cr)

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0		**Water Resources -I**	07
	1.1	Introduction to surface resources	
	1.2	Introduction to groundwater resources	
	1.3	Monitoring and maintenance of water resources	
	1.4	Different sources of water pollution	
2.0		**Sampling and methodology for Water analysis -II**	08
	2.1	Sampling methods	
	2.2	Materials required for Water quality analysis	
	2.3	Methods of Water quality analysis	
	2.4	Precautions during Water quality analysis	
3.0		**Water quality analysis -III**	07
	3.1	Physical parameters of Water quality analysis	
	3.2	Determination of pH and Total Hardness of water samples	
	3.3	Determination of TDS and Alkalinity of water samples	
	3.4	Determination of Chlorides of water samples	
4.0		**Permissible limits of water quality and health hazards -IV**	08
	4.1	BIS Permissible limits of water quality	
	4.2	WHO Permissible limits of water quality	
	4.3	Health hazards in relation to surface or groundwater	
	4.4	Remedial measures for health hazards	
		Total	30

Text Books & Reference Books:

1. Cairncross, Sandy, and Richard Feachem. Environmental Health Engineering in the Tropics: An Introductory Text. Chichester, UK: John Wiley & Sons, 1993, chapter 1 and appendix C. ISBN: 9780471938859.

2. Colford, John, Jr., and Lorna Fewtrell. "Water, Sanitation and Hygiene: Interventions and Diarrhoea: A Systematic Review and Meta-analysis." Health, Nutrition and Population Discussion Paper, World Bank, 2004.

3. Nath, K. J., S. Bloomfield, and M. Jones. Household Water Storage, Handling and Point-of-use Treatment. International Scientific Forum on Home Hygiene, 2006, pp. 5 and 24-29.

4. World Health Organization. Guidelines for Drinking-water Quality. 3rd edition, vol. 1. Recommendations. Geneva, Switzerland: World Health Organization, 2004, chapters 1, 2, 3, 4 and 7. ISBN: 9789241546386.

5. Naiman, R.J. (1994) Watershed Management: Balancing Sustainability and Environmental Change, Springer

6. Raghunath H.M. (2003) Groundwater, New age education.

7. Todd, D. K. and Mayo, L. W. (2004) Groundwater hydrology, Wiley.

Vocational and Skill Enhancement Courses (SEC)

Curriculum Details:*(There shall be FOUR Modules in each course)* Semester III

SGLGGE1201: Watershed Management (Elective -I) (Pr) (2cr)

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0		**Introduction to Watershed -I**	07
	1.1	Concept Watershed	
	1.2	Objective of watershed development	
	1.3	Need for watershed development in India	
	1.4	Water and socioeconomic STATUS	
2.0		**Characteristics of Watershed -II**	08
	2.1	Watershed Size, shape, geography, slope, drainage, geology,	
	2.2	Demarcation of watershed and classification	
	2.3	Watershed codification	
	2.4	Watershed functions	
3.0		**Watershed Management -III**	07
	3.1	Watershed management in India	
	3.2	Integrated and multi-disciplinary approach for watershed management	
	3.3	Planning of activities, Participatory Rural Appraisal (PRA), preparation of action plan	
	3.4	Administrative requirements for watershed management	
4.0		**Watershed Management in Natural Resources -IV**	08
	4.1	Watershed Soil management	
	4.2	Watershed Water management	
	4.3	Watershed Agricultural management	
	4.4	Integrated and multi-disciplinary approach for watershed management	
		Total	30

Text Books & Reference Books:

1. Brooks, K.N. Folliott, P.F., Magner, J.A. (2012) Hydrology and the Management of Watersheds, John Wiley & Sons

2. Debarry, P. A. (2004) Watersheds: Processes, Assessment and Management, Wiley

3. Gonenc, I.E., Vadineanu ,A., Wolflin, J.P. (2014) Sustainable Use and Development of Watersheds, Springer

4. Heathcote, I.W. (2009) Integrated Watershed Management: Principles and Practice, John Wiley & Sons Ltd.

5. Karanth K.R. (1987) Groundwater assessment development and management, Tata Mcgrath Hill education.

6. Murthy, J.V.S. (2012) Watershed Management New Age International Publisher

Vocational and Skill Enhancement Courses (SEC/SC)

Curriculum Details:*(There shall be FOUR Modules in each course)* Semester IV

SGLGSC1251: Completion of Geological maps from contour data (Pr) (2cr)

Module No.	Unit No.	Topic	Hrs. Required to cover contents
1.0		**Toposheet map reading -I**	07
	1.1	Reading of toposheet maps	
	1.2	Definition of Contour	
	1.3	Contour maps and types	
	1.4	Geography of area in maps (high ground, hills, valleys saddles etc)	
2.0		**Geological Map Reading -II**	08
	2.1	Terminologies like Dip, strike and outcrop of the bed	
	2.2	Horizontal and inclined beds.	
	2.3	Structures in Geological Maps	
	2.4	Igneous intrusion in Geological Maps	
3.0		**Preparation of geological -III**	07
	3.1	Preparation of geography of the map	
	3.2	Preparation of geological formations on the map from data given	
	3.3	Folds and faults in Geological Maps	
	3,4	Unconformities in Geological Maps	
4.0		**Sections and interpretation of geological -IV**	08
	4.1	Technique and procedure for completion of geological maps	
	4.2	Draw sections along X-Y	
	4.3	Interpretation of geological maps	
	4.4	Preparation of at least 5 maps containing horizontal strata, dipping strata, fold, fault and unconformity	
		Total	30

Text Books & Reference Books:

1. Compton Robert R. (1962) Manual of Field Geology John Wiley & Sons.

2. Field Geology McGraw – Hill Book Company, Inc. 6thed.

3. Gokhale N.W. (2001) A Guide to Field Geology. CBS Publishers & Distributors 1st ed.

4. Lahee Fredrick H. (1961) Geology in the field by Robert R. Compton, John Wiley &Sons.

5. Mathur S.M. (2004) Guide to Field Geology, PHI.

6. Richard J Lisle Geological Structures and Maps: A Practical Guide. Elsevier Science | Publisher Imprint: Butterworth-Heinemann

Vocational and Skill Enhancement Courses (SEC/SC)

Curriculum Details:*(There shall be FOUR Modules in each course)* Semester IV

SGLGSC1251: Surveying and Levelling (Elective -1) (Pr) (2cr)

Module No.	Unit No	Topic	Hrs. Required to cover the contents
1.0		**Introduction**	08
	1.1	Definition and objective of surveying.	
	1.2	Introduction of various units used for measuring length, area, volume	
	1.3	Formulas used for determination of length, area, volume	
	1.4	Methods and Conversion of units	
2.0		**Instruments and Levelling**	07
	2.1	Brief description of various levelling instruments	
	2.2	Components of levelling instruments	
	2.3	Methods used in levelling	
	2.4	Abney level	
3.0		**Types of surveying**	08
	3.1	Chain Surveying	
	3.2	Plane Table Survey: Brief description of Instruments and use in the field	
	3.3	Compass Surveying: Introduction, working principle and field procedure	
	3.4	Theodolite Survey: Introduction, principle and procedure	
4.0		**Use and Difficulties**	07
	4.1	Use of surveying	
	4.2	Use of levelling	
	4.3	Difficulties in surveying	
	4.4	Levelling difficulties	
		Total	**30**

Text Books & Reference Books

1. Surveying and leveling, Part-I, T. P. Kanetkar, S. V. Kulkarni, 23rd edition, 1999

2. Remote Sensing and GIS, By Anji Reddey

3. Surveying and levelling –Part-II, T. P.Kanetkr, S. V. Kulkarni

4. Surveying, Vol I and II, Dr B. C. Punmia

5. Surveying, Vol I and II, S. K. Duggal Surveying, Vol-I, Arora K R, 1990