அறிவே அனைத்தும் ஆற்றலும்
KNOWLEDGE IS POWER

# MANONMANIAM SUNDARANAR UNIVERSITY

Tirunelveli - 627012, Tamil Nadu, India

# STRUCTURE AND DETAILED SYLLABUS

## Undergraduate Course (B.Sc.) in Geology

*Learning Outcome based Curriculum*
(Under CBCS)

**For Affiliated Colleges**

Common Course Structure for B.Sc., GEOLOGY – 2026-2027


MANONMANIAM SUNDARANAR UNIVERSITY
Tirunelveli - 627012

**Structure and Detailed Syllabus**

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**(Under CBCS)**

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**Common Course Structure for B.Sc., GEOLOGY**

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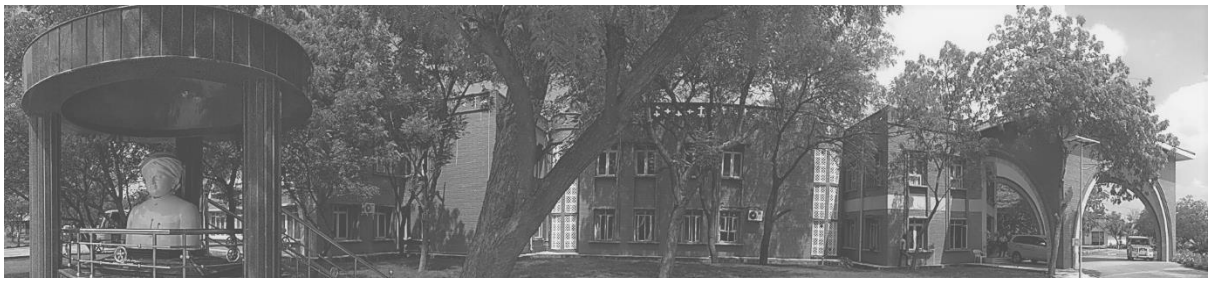

2026-2027

## OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

### 1. UNIVERSITY VISION

"To provide quality education to reach the un-reached"

### 2. UNIVERSITY MISSION

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

### 3. PREAMBLE

Outcome Based Education (OBE) is the order of the day in all Higher Education Institutions to emphasize quality mandate. Curriculum tailored with Choice Based Credit System (CBCS) for ensuring flexibility; Exposure to learning opportunities using the latest technological advancements to the learners for continuous lifelong learning; and Adoption of Revised Bloom's Taxonomy (RBT) in the assessment mechanism are essential to add value to the existing OBE. The current revision is aimed at providing scope for effective implementation of OBE by including Programme Educational Outcomes, Programme Outcomes, and Programme Specific Outcomes in alignment to the vision and mission of the University. Courses need to be framed and mapped such that the compilation of the Outcomes of all Courses in the programme ensures the attainment of the programme outcomes in terms of RBT.

## 4. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

In alignment with the Vision and Mission of the University, the following have been defined as the PEO for the graduates.

**PEO1:** Developing strong positive attitude to learn independently the concepts in the field of study

**PEO2:** Ensuring confidence among the learners to apply the knowledge and skills gained to solve real life issues

**PEO3:** Habituating ethical values among the learners to succeed in personal and professional life

## 5. PROGRAMME OUTCOMES (POs)

Programme Outcomes for the Under Graduate Degree Programmes of the University are articulated as under.

After the successful completion of Undergraduate Programme from the University, the learner should be able to

**PO1:** Comprehend the knowledge acquired and communicate the same to others

**PO2:** Analyze and compare the factual data / situation to comprehend and to critically evaluate to find solution to the problem ahead

**PO3:** Apply theories and philosophies learned in solving the problem in scientific manner

**PO4:** Think reflectively on the earlier activities and attempt for self-directed lifelong learning process

**PO5:** Understand multicultural existence and identify the means to prolong moral/ethical values in personal and professional life

**PO6:** Expose the learner to the digital technology to learn through multiple sources

**PO7:** Train the learner to be a responsible player in teams and impart leadership qualities in them.

## 6. PROGRAMME SPECIFIC OUTCOMES (PSO)

On completion of the programmed, graduates will be able to:

**PSO1: Disciplinary Knowledge**

Apply fundamental and theoretical knowledge of mathematics, including algebra, analysis, geometry, and statistics, to support higher studies, research, and innovation.

**PSO2: Critical Thinking**

Analyze mathematical problems critically and evaluate appropriate methods and solutions in academic, industrial, and societal contexts.

**PSO3: Problem Solving**

Solve mathematical and real-life problems using logical reasoning, analytical thinking, and computational techniques.

**PSO4: Analytical Reasoning**

Interpret data and mathematical models using quantitative techniques to address scientific and sustainability-related challenges.

**PSO5: Research Skills**

Demonstrate basic research aptitude by formulating problems, collecting and analyzing data, and presenting findings effectively.

**PSO6: Self-directed Learning**

Engage in lifelong learning and adapt to advancements in mathematics, science, and technology.

**PSO7: Employability and Entrepreneurship**

Develop skills for employability, entrepreneurship, and career readiness in industry, education, and technology-driven sectors.

**Each Course has to address a minimum of 4 PSOs**

Level of contribution of the Course towards attaining PSOs

0 – No Contribution 1 – Low Level 2 – Medium Level 3 – High Level

| S.No. | Course Title | Course-wise PSO Summary |
|---|---|---|
| 1 | **General Geology** | Fundamentals of Earth Systems and Geological Processes |
| 2 | **Practical: General Geology** | Application of Geological Principles and Problem Solving |
| 3 | **Field Techniques in Geology** | Geological Mapping, Sampling and Field Investigation Skills |
| 4 | **Foundation Course** | Basic Earth Science and Environmental Awareness |
| 5 | **Mineralogy and Crystallography** | Mineral Identification, Crystal Structures and Optical Properties |
| 6 | **Practical: Mineralogy and Crystallography** | Mineral Identification and Crystallographic Analysis Skills |
| 7 | **Natural Hazards and Mitigation** | Hazard Assessment, Disaster Management and Risk Reduction |
| 8 | **Remote Sensing and GIS** | Geospatial Technology and Geological Data Analysis |

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| **General Geology** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Practical: General Geology** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Field Techniques in Geology** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Foundation Course** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Mineralogy and Crystallography** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Practical: Mineralogy and Crystallography** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Natural Hazards and Mitigation** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |
| **Remote Sensing and GIS** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

## 7. PROGRAMME DETAILS

| | |
|---|---|
| **Programme** | **B.Sc. GEOLOGY** |
| **Eligibility** | 10+2 qualification with science subjects, primarily Physics, Chemistry, and Mathematics (PCM) or Biology (PCB), with at least 50-60% aggregate marks. |
| **Medium of Instruction** | English |
| **Duration:** | 3 Years (UG) |

## 8. EXAMINATION SCHEME

| Methods of Evaluation | | |
|---|---|---|
| Internal Evaluation | Continuous Internal Assessment Test | **25 Marks (Theory)**<br>**50 (Practical)** |
| | Assignments | |
| | Seminars | |
| | Attendance and Class Participation | |
| External Evaluation | End Semester Examination | **75 Marks (Theory)**<br>**50 (Practical)** |
| | Total | **100 Marks** |
| **Methods of Assessment** | | |
| Recall (K1) | Simple definitions, MCQ, Recall steps, Concept definitions. | |
| Understand/Comprehend (K2) | MCQ, True/False, Short essays, Concept explanations, short summary or Overview. | |
| Application (K3) | Suggest idea/concept with examples, suggest formulae, Solve problems, Observe, Explain. | |
| Analyze(K4) | Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge. | |
| Evaluate (K5) | Longer essay/Evaluation essay, Critique or justify with pros and cons. | |
| Create (K6) | Check knowledge in specific or offbeat situations, discussion, debating or Presentations. | |

**Passing Minimum**

The candidate shall be declared to have passed the examination if the candidates secure not less than 30 marks out of 75 marks in the semester examination in each theory course and in total (CIA mark + Theory Exam mark) not less than 40 marks.

The candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 20 marks out of 50 marks in the Practical Exam conducted by the University. **There is no passing minimum for the internal exam.**

Candidate who does not obtain the required minimum marks for a pass in a Course/Practical shall be declared Re-Appear (RA) and the candidate has to appear and pass the same at a subsequent appearance.

## 9. QUESTION PAPER PATTERN

**Semester End Examinations (75 Marks)**

Note: In both Internal and Semester End Examinations

For UG - Lower Order Thinking (K1, K2, & K3) – 60 % in each part

Higher Order Thinking (K4, K5, & K6) – 40 % in each part

| | |
|---|---|
| PART – A Choose the correct answer | (10 × 1 = 10) |
| PART – B Answer ALL Questions. Choosing either (a) or (b) | (5 × 5 = 25) |
| PART – C Answer ALL Questions. Choosing either (a) or (b) | (5 × 8 = 40) |

## 10. MODEL QUESTION PAPER

**MANONMANIAM SUNDARANAR UNIVERSITY**

**B.Sc. Degree Examination – Geology**

**Semester Examination**

**Major - GENERAL GEOLOGY**

**Time: 3 Hours** **Maximum Marks: 75**

**PART – A (10 × 1 = 10)**

**Choose the correct answer**

1. The Nebular hypothesis regarding the origin of the Earth was proposed by
   a) Laplace
   b) Holmes
   c) Wegener
   d) Daly
   (K1)

2. Carbon dating method is mainly used for determining the age of
   a) Igneous rocks
   b) Organic remains
   c) Metamorphic rocks

d) Sedimentary structures

(K2)

3. Frost wedging is more active in regions where

   a) Alternate freezing and thawing occur

   b) Chemical reactions dominate

   c) High humidity persists continuously

   d) Strong ocean currents exist

   (K3)

4. Oxidation of iron-bearing minerals generally results in

   a) Formation of sand dunes

   b) Development of reddish weathered surfaces

   c) Formation of river terraces

   d) Formation of glacial valleys

   (K4)

5. Presence of U-shaped valleys and moraines indicates the action of

   a) Wind

   b) Groundwater

   c) Glaciers

   d) Sea waves

   (K5)

6. A geomorphologist relating coastal erosion with landform development would associate wave erosion with

   a) Delta formation

   b) Sea arch formation

   c) Alluvial fan development

   d) Drumlin formation

   (K6)

7. Dendritic drainage patterns commonly develop over
   a) Uniform rock structures
   b) Folded mountain belts
   c) Faulted terrains
   d) Volcanic cones
   (K2)

8. Artesian wells are formed when groundwater
   a) Occurs above the water table
   b) Is under confined pressure
   c) Flows only through fractures
   d) Exists in dry desert regions
   (K3)

9. Fold mountains like the Himalayas are mainly associated with
   a) Divergent boundaries
   b) Ocean–ocean convergence
   c) Continent–continent convergence
   d) Transform boundaries
   (K4)

10. Intensity scale of earthquakes mainly measures
    a) Energy released at focus
    b) Velocity of seismic waves
    c) Effects and damage caused at a place
    d) Distance of epicenter from focus
    (K5)

**PART – B (5 × 5 = 25)**

**Answer ALL Questions. Choosing either (a) or (b)**

11. (a) Explain the various theories regarding the origin of the Earth. (K2)

(OR)

(b) Describe the composition and constitution of the Earth's interior. (K2)

12. (a) Discuss the processes of mechanical and chemical weathering. (K3)

(OR)

(b) Explain the role of wind as a geological agent in erosion and deposition. (K3)

13. (a) Analyze the erosional and depositional features produced by glaciers. (K4)

(OR)

(b) Analyze the marine erosional and depositional landforms formed by sea waves. (K4)

14. (a) Evaluate the development of drainage patterns and stream erosional features. (K5)

(OR)

(b) Evaluate the role of groundwater in erosion, transportation and deposition. (K5)

15. (a) Construct a detailed classification of volcanoes and their products. (K6)

OR)

(b) Develop a detailed account of earthquakes, seismic waves and tsunami effects. (K6)

## PART – C (5 × 8 = 40)

**Answer ALL Questions. Choosing either (a) or (b)**

16. (a) Analyze the significance of radiometric dating methods in determining the age of the Earth. (K4)

(OR)

(b) Analyze the importance of relative and absolute dating techniques in geological studies. (K4)

17. (a) Evaluate the influence of weathering processes on soil formation and soil horizons. (K5)

(OR)

(b) Evaluate the formation and significance of desert landforms produced by wind action. (K5)

18. (a) Construct a comprehensive account of glacial processes and associated landforms. (K6)

(OR)

(b) Construct a detailed explanation of marine processes and coastal landforms. (K6)

19. (a) Analyze the erosional and depositional activities of streams with suitable examples. (K4)

(OR)

(b) Analyze groundwater movement and associated depositional landforms. (K4)

20. (a) Evaluate the theory of plate tectonics and the causes of plate movement. (K5)

(OR)

(b) Evaluate the relationship between plate tectonics, volcanism and earthquakes. (K5)

## 11. COURSE OUTCOMES (COs)

**Four Course Outcomes** (COs) for each course that can be achieved by the learners on completion of that particular course are as follows:

Considering outcomes related to

i. K1 and K2 level of evaluation in all the Units as CO1

ii. K3 level of evaluation in all the Units as CO2

iii. K4 level of evaluation in all the Units as CO3

iv. K5 and K6 level of evaluation in all the Units as CO4.

All the COs proposed in each of the courses should be mapped with POs based on the relevance.

Level of Correlation between COs and POs

0 – No Correlation 1 – Low 2 – Medium 3 – High

**12. Highlights of the Revamped Curriculum**:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.
- The core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The general studies and statistics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the industry-Academia interface and provide more job opportunities for the students.
- The statistical quality control course is included to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship/Industrial training/Geological field visit during the fifth semester will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

## 13. CREDIT DISTRIBUTION

| 3 – Year UG Programme<br>Credits Distribution | | | |
|---|---|---|---|
| | | **No. of Papers** | **Credits** |
| **Part I** | Tamil (3 Credits) | 4 | 12 |
| **Part II** | English (3 Credits) | 4 | 12 |
| **Part III** | Core Courses and<br>Elective Courses | 15+12 | 91 |
| **Part IV** | Foundation Course | 1 | 2 |
| | Skill Enhancement Courses | 5 | 6 |
| | EVS | 1 | 2 |
| | Value Education | 1 | 2 |
| | Internship/Industrial Visit/ Field Visit | 1 | 2 |
| **Part V** | Extension Activity | 1 | 1 |
| | Naan Mudhalvan | 5 | 10 |
| **Total Credits for the UG Programme** | | | **140** |

*Part I, II, and III components will be separately taken into account for CGPA calculation and classification for the under graduate programme. The other components Part IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree

## CREDIT DISTRIBUTION FOR B.Sc., GEOLOGY COURSE

## 2026-2027

| SUBJECT | | | Subject Code | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CIA | EXT | Total |
| | Part | **I Semester** | | | | | | |
| 1 | I | Tamil | | 3 | 6 | 25 | 75 | 100 |
| 2 | II | English | | 3 | 6 | 25 | 75 | 100 |
| 3 | III | Core: General Geology | | 6 | 6 | 25 | 75 | 100 |
| 4 | III | Core: Practical: General Geology | | 2 | 2 | 50 | 50 | 100 |
| 5 | III | Allied: Chemistry -I | | 3 | 4 | 25 | 75 | 100 |
| 6 | III | Allied: Chemistry -I Practical | | 2 | 2 | 50 | 50 | 100 |
| 7 | IV | SEC-1: Field Techniques in Geology | | 2 | 2 | 25 | 75 | 100 |
| 8 | IV | Foundation Course | | 2 | 2 | 25 | 75 | 100 |
| | | Total | | **23** | **30** | | | |
| | **II Semester** | | | | | | | |
| 1 | I | Tamil | | 3 | 6 | 25 | 75 | 100 |
| 2 | II | English | | 3 | 4 | 25 | 75 | 100 |
| 3 | III | Core: Mineralogy and Crystallography | | 6 | 6 | 25 | 75 | 100 |
| 4 | III | Core Practical: Mineralogy and Crystallography | | 2 | 2 | 50 | 50 | 100 |
| 5 | III | Allied Chemistry -II | | 3 | 4 | 25 | 75 | 100 |
| 6 | III | Allied Chemistry -II Practical | | 2 | 2 | 50 | 50 | 100 |
| 7 | IV | SEC-2: Natural Hazards and Mitigation | | 1 | 2 | 25 | 75 | 100 |
| 8 | IV | SEC-3: Remote Sensing and GIS | | 1 | 2 | 25 | 75 | 100 |
| 9 | | Naan Mudhalvan (Mandatory) Environmental and Engineering Geology (Arrear student) | | 2 | 2 | - | - | 100 |
| | | Total | | **23** | **30** | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **III Semester** | | | | | | | |
| 1 | I | Tamil | | 3 | 6 | 25 | 75 | 100 |
| 2 | II | English | | 3 | 6 | 25 | 75 | 100 |
| 3 | III | Core: Palaeontology | | 4 | 4 | 25 | 75 | 100 |
| 4 | III | Core Practical: Palaeontology | | 3 | 2 | 50 | 50 | 100 |
| 5 | III | Allied Physics-I | | 3 | 4 | 25 | 75 | 100 |
| 6 | III | Practical: Allied Physics | | 2 | 2 | 50 | 50 | 100 |
| 7 | IV | SEC-4: Water quality assessment techniques | | 2 | 2 | 25 | 75 | 100 |
| 8 | IV | EVS | | 2 | 2 | 25 | 75 | 100 |
| 9 | | Naan Mudhalvan (Mandatory) Fundamentals of Geology (Arrear student) | | 2 | 2 | - | - | 100 |
| | | Total | | **24** | **30** | | | |
| | **IV Semester** | | | | | | | |
| 1 | I | Tamil | | 3 | 6 | 25 | 75 | 100 |
| 2 | II | English | | 3 | 6 | 25 | 75 | 100 |
| 3 | III | Core: Structural Geology | | 4 | 4 | 25 | 75 | 100 |
| 4 | III | Core Practical– Structural Geology | | 3 | 2 | 50 | 50 | 100 |
| 5 | III | Allied Physics-II | | 3 | 4 | 25 | 75 | 100 |
| 6 | III | Practical: Allied Physics | | 2 | 2 | 50 | 50 | 100 |
| 7 | IV | SEC-5: Elements of Geochemistry | | 2 | 2 | 25 | 75 | 100 |
| 8 | IV | Value Education | | 2 | 2 | 25 | 75 | 100 |
| 9 | | Naan Mudhalvan (Mandatory) Earth and Climate (Arrear student) | | 2 | 2 | - | - | 100 |
| | | Total | | **24** | **30** | | | |
| | **V Semester** | | | | | | | |
| 1 | III | Core: Igneous Petrology | | 4 | 5 | 25 | 75 | 100 |
| 2 | III | Core: Sedimentary and Metamorphic Petrology | | 4 | 5 | 25 | 75 | 100 |
| 3 | III | Core: Hydrogeology | | 4 | 5 | 25 | 75 | 100 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | III | Core Practical: Petrology and Hydrogeology | | 3 | 5 | 50 | 50 | 100 |
| 5 | III | Elective: Stratigraphy or Environmental Geology | | 3 | 4 | 25 | 75 | 100 |
| 6 | III | Elective: Marine Geology or Engineering Geology | | 3 | 4 | 25 | 75 | 100 |
| 7 | IV | Internship / Industrial Training / Geological Field studies. (Report evaluation and viva-voce by External examiners) | | 2 | - | 50 | 50 | 100 |
| 8 | | Naan Mudhalvan (Mandatory) Geomorphology (Arrear student) | | 2 | 2 | - | - | 100 |
| | | Total | | **25** | **30** | | | |
| | **VI Semester** | | | | | | | |
| 1 | III | Core: Economic Geology and Mineral Economics | | 4 | 6 | 25 | 75 | 100 |
| 2 | III | Core: Applied Geology | | 4 | 6 | 25 | 75 | 100 |
| 3 | III | Core Practical: Economic Geology and Mineral Economics & Applied Geology | | 4 | 6 | 50 | 50 | 100 |
| 4 | III | Elective: Regional Geology or Geostatistics and Computer Applications in Geology | | 3 | 5 | 25 | 75 | 100 |
| 5 | III | Elective: Geophysics and Exploration Techniques or Disaster management | | 3 | 5 | 25 | 75 | 100 |
| 6 | V | Extension Activity- Long Geological field studies (Maximum 14 Days) (Report evaluation and viva-voce by External examiners) | | 1 | - | 50 | 50 | 100 |
| 7 | | Naan Mudhalvan (Mandatory) Geohazards (Arrear student) | | 2 | 2 | - | - | 100 |
| | | Total | | **21** | **30** | | | |
| | | | **Total** | **140** | | | | |

## B.SC. GEOLOGICAL FIELD WORK

**(Mandatory requirements for the completion of B.Sc. Geology programme)**

It is an integral part of the course; students should be taken to a field training during the academic year.

**FIRST YEAR**

Students should be taken to the Physical geology or minerals aspects or decision by the Professor in-charge of geological study visit. The duration of the trip maximum 2 days either first or second semester and submit a report at the time of 5$^{th}$ semester practical examination. Report evaluation and viva-voce conducted by Internal and External examiners **(2 Credits; Internal 50 and External 50 Marks)**.

**SECOND YEAR**

1. Students should be taken to nearby area and familiarize palaeontological and or structural aspect or decision by the Professor in-charge, collect geological samples from the field and display at the time of 5$^{th}$ semester practical examination. Report evaluation and viva-voce conducted by Internal and External examiners. The duration of the trip maximum 2 days either third or fourth semester.

2. Students should be taken to geological mapping camp, the area chosen by the Professor in-charge and the duration of the camp maximum 7 days either third or fourth semester and submit a report at the time of 5$^{th}$ semester practical examination. Report evaluation and viva-voce conducted by Internal and External examiners **(2 Credits; Internal 50 and External 50 Marks)**.

**THIRD YEAR**

1. Students should be taken to the coastal geomorphological aspects/decision by the Professor in-charge of geological study visit. The duration of the trip maximum 2 days in fifth semester and submit a report at the time of 5$^{th}$ semester practical examination. Report evaluation and viva-voce conducted by Internal and External examiners **(2 Credits; Internal 50 and External 50 Marks)**.

2. A visit to geologically interested and mineralized zones in South India, it includes mines visit, fossils, minerals, rocks and economic minerals collection and display at the time of their 6$^{th}$ semester practical examination for internal and external evaluation. The duration may be for two weeks in 6$^{th}$ semester **(1 Credits; Internal 50 and External 50 Marks).**

## Semester-I

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **General Geology** | Core | Y | - | - | - | 5 | 5 | 25 | 75 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the origin, structure, composition, and age determination methods of the Earth. |
| CO2 | To study weathering processes, soil formation, and geomorphic activities of wind. |
| CO3 | To analyze the geological work of glaciers, sea, streams, and groundwater. |
| CO4 | To interpret erosional, transportation, and depositional landforms produced by different geological agents. |
| CO5 | To understand plate tectonics, volcanism, earthquakes, and associated geological hazards. |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | A brief account of various theories regarding the origin of earth. Interior of the Earth: an outline of the composition and constitution of the interior of earth. Age of the earth: relative dating and absolute dating – radiometric dating: Potassium – Argon, Rubidium – Strontium, Uranium – Lead, Lead –Lead, Fission track dating and Carbon dating method. | 15 | CO1 |
| II | Rock weathering: Geology and weathering-agents of weathering, processes of weathering-mechanical weathering: Frost wedging, frost heaving, saltaction and sheeting, chemical weathering: solution, hydration, hydrolysis, oxidation/reduction, carbonation and chelation. Biotic weathering: biophysical and biochemical. Mix processes: spheroidal, exfoliation and differential weathering. Soil–definition, types and formation process of soils- Soil Horizon Wind as a Geological Agent: erosional methods: deflation, corrosion and its impact. Erosional features-By abrasion: undercut hills, cave rock, mushroom rock, mesa, yardang, ventifacts. By Deflation: desert pavement, deflation hallows. Transportation-saltation, suspension and traction. Deposition-causes and types, pile and sheets deposits-dune formation, migration and different forms. Desert: description, kinds and desert features: plains, bajadas and pediment. | 15 | CO2 |
| III | Work of Glaciers: Types of glaciers: cirque, valley, piedmonts and continental glaciers- Glacial | 15 | CO3 |

| | | | |
|---|---|---|---|
| | movement-erosional processes-erosional features-depositional features.<br>Work of sea and its deposits: waves, breakers, rip-current, long-shore current. Processes of erosion, erosional features: wave cut terraces, sea cave and arch, headland, stacks, transportation and various depositional features: beaches and barriers, spits and bars, deltas, wave-built terraces. Ocean deposits: shallow water and deep-water deposits. | | |
| IV | Development of drainage system and work of stream: channel characteristics- stream erosion characteristics, types of streams, drainage patterns, Erosional features-valleys, river piracy, waterfalls, cascade, water gaps, pot holes and plunge pools, river terraces, meanders, ox-bow lakes, pediments and peneplains, transportation methods, causes of stream deposition, depositional features-deltas, point bars, natural levees, alluvial fans, floodplain, back swamps, and braided rivers. Types of streams and drainage patterns.<br>Work of Ground water: movement of ground water due to gravity and pressure difference- ground water discharge-springs, wells and artesian wells and springs, thermal springs. Erosion by ground water and erosional features. Transportation by ground water, deposition by ground water and forms of deposits. | 15 | CO4 |
| V | Plate tectonics: Historical background –Characteristics of plates – Major plates – plate movements – Plate boundaries: divergent: mid-oceanic ridges, continental rift, triple junction, geological characters; convergent: ocean – ocean, ocean – continent, continent – continent convergence, geological characters and transform fault boundary - causes for the plate movement. Volcanoes: classification: based on state of the volcano, structure of volcano, kind of material erupted, eruptive force and location of volcano. Products of volcano: Gases, liquids, and solids. Earthquake- Definition - causes- classification-seismic waves: Body waves and surface waves-earthquake detection and measurement–determination of epicenter – scale of earthquake: intensity and magnitude scale- effects of earthquakes– Tsunami-causes and effects. | 15 | CO5 |
| | **Total** | **75** | |
| **Text Books (Latest Editions)** | | | |
| 1. | Radhakrishnan, V, General Geology, V.V.P. Publishers, Tuticorin (1996) | | |
| 2. | Arthur Holmes, Principles of Physical Geology: Thomas Nelson & sons London. (1992) | | |

| | |
|---|---|
| 3. | Patwardhan, A. M., Dynamic Earth System, Prentice Hall, New Delhi (1999) |
| 4. | Mukherjee A.K, Principles of Geology, EW Press, Kolkata (1990) |
| 5. | Reed, J.S. & T.H. Wicander, Essentials of Geology, McGraw Hill., New York (2005) |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | |
| 1. | Charles C. Plummer, Diane H. Carlson and Lisa Hammersley (2019). 'Physical Geology' (16$^{th}$Ed). McGraw-Hill Education. |
| 2. | Strahler A. M (1965). Introduction to Physical Geology. Wiley. |
| 3. | Gass, I.G., Smith, P.S & Wilson, R.C.L., 2ndEdt., (1972), Understanding the Earth, The English Language Books Society, London |
| 4. | Robert, S.A. and Suzanne, P.A., (2010) Geomorphology – The mechanics and chemistry of landscapes. Cambridge University Press. |
| 5. | Mahapatra, G. B. (2018). Textbook of Physical Geology. India: CBS Publishers & Distributors. |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| General Geology | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain the origin, internal structure, and age determination methods of the Earth |
| CO2 | Analyze weathering processes, soil formation, and geomorphic activities of wind and glaciers |
| CO3 | Interpret the geological work of sea, streams, and groundwater and associated landforms |
| CO4 | Evaluate plate tectonics, volcanism, earthquakes, and geological hazards |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

**Semester I**

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **General Geology Practical** | Core | Y | - | - | - | 3 | 3 | 50 | 50 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the origin, interior structure, and age determination methods of the Earth through geological principles and calculations. |
| CO2 | To study weathering, soil formation, and aeolian processes using quantitative geological methods. |
| CO3 | To analyze glacial and marine geological processes through numerical and practical exercises. |
| CO4 | To apply calculations related to rivers, groundwater flow, and topographic analysis. |
| CO5 | To evaluate plate tectonics, mountain building, and earthquake parameters using geological computations. |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | **Origin of Earth, Interior of Earth & Age of Earth**<br>1. Identification of geological events in an area using fundamental geological principles:<br>o Law of Superposition<br>o Law of Original Horizontality<br>o Law of Cross-Cutting Relationships<br>o Conformity and Unconformity<br>2. Relative dating methods and radiometric dating calculations.<br>3. Interior of the earth – seismic wave velocity calculations. | 09 | CO1 |
| II | **Weathering, Soil & Wind as a Geological Agent**<br>1. Calculations related to the rate of weathering and soil formation.<br>2. Wind as a geological agent:<br>o calculations of wind velocity,<br>o sediment transport,<br>o dune migration rates. | 09 | CO2 |
| III | **Glaciers & Marine Processes**<br>1. Glaciers as geological agents:<br>o calculations of glacial erosion,<br>o deposition,<br>o rates of glacial advance and retreat.<br>2. Marine processes as geological agents:<br>o wave velocity,<br>o wave period, | 09 | CO3 |

| | | | |
|---|---|---|---|
| | ○ coastal erosion calculations. | | |
| IV | **Rivers, Groundwater & Topographic Analysis**<br>1. Rivers as geological agents:<br>○ stream gradient,<br>○ discharge,<br>○ sediment transport calculations.<br>2. Meander geometry calculations and mapping exercises.<br>3. Groundwater flow calculations including:<br>○ hydraulic gradient,<br>○ Darcy's law,<br>○ transmissivity.<br>4. Relief and gradient analysis using topographic maps. | 09 | CO4 |
| V | **Plate Tectonics & Earthquakes**<br>1. Determination of the direction and velocity of plate movement.<br>2. Mountain building (orogenic uplift) and erosion rate calculations.<br>3. Earthquake – epicentre calculations. | 09 | CO5 |
| | **Total** | **45** | |
| **Text Books (Latest Editions)** | | | |
| 1. | Radhakrishnan, V., General Geology, V.V.P. Publishers, Tuticorin (1996). | | |
| 2. | Arthur Holmes, Principles of Physical Geology, Thomas Nelson & Sons, London (1992). | | |
| 3. | Patwardhan, A.M., Dynamic Earth System, Prentice Hall of India, New Delhi (1999). | | |
| 4. | Mukherjee, A.K., Principles of Geology, World Press Pvt. Ltd., Kolkata (1990). | | |
| 5. | Mahapatra, G.B., Textbook of Physical Geology, CBS Publishers & Distributors, New Delhi (2018). | | |
| 6. | Thornbury, W.D., Principles of Geomorphology, Wiley Eastern Ltd., New Delhi (2004). | | |
| 7. | Singh, Savindra, Geomorphology, Prayag Pustak Bhawan, Allahabad (2018). | | |
| 8. | Lal, D.S., Climatology and Oceanography, Sharda Pustak Bhawan, Allahabad (2012). | | |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | | | |
| 1. | Plummer, C.C., Carlson, D.H. & Hammersley, L., Physical Geology, McGraw-Hill Education, New York (2019). | | |
| 2. | Tarbuck, E.J., Lutgens, F.K. & Tasa, D., Earth: An Introduction to Physical Geology, Pearson Education, New Delhi (2017). | | |
| 3. | Skinner, B.J. & Porter, S.C., The Dynamic Earth: An Introduction to Physical Geology, Wiley, New York (2000). | | |
| 4. | Keller, E.A. & Blodgett, R.H., Natural Hazards: Earth's Processes as | | |

| | |
|---|---|
| | Hazards, Disasters and Catastrophes, Pearson Education (2008). |
| 5. | Davis, W.M., Physical Geography, Ginn and Company, New York (1908). |
| 6. | Fetter, C.W., Applied Hydrogeology, Pearson Education, New Delhi (2001). |
| 7. | Bloom, A.L., Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, Prentice Hall, New Delhi (2003). |


**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Practical General Geology | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Apply geological principles and radiometric methods to interpret geological events and Earth history |
| CO2 | Analyze weathering, soil formation, wind action, and related geomorphic calculations |
| CO3 | Perform calculations related to glacial, marine, river, and groundwater geological processes |
| CO4 | Evaluate tectonic movements, mountain building, earthquake parameters, and topographic features using quantitative methods |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 – High

## Semester I

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Field Techniques in Geology** | SEC-1 | Y | - | - | - | 2 | 2 | 25 | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | |
| CO1 | To understand the importance of field studies and geological mapping techniques in geology. | | | | | | | | | | |
| CO2 | To develop skills in handling and using geological field instruments and equipment. | | | | | | | | | | |
| CO3 | To study methods of geological sampling and field data collection. | | | | | | | | | | |
| CO4 | To analyze geological outcrops, rock contacts, and structural measurements in the field. | | | | | | | | | | |
| CO5 | To prepare geological reports using standard scientific methods and field observations. | | | | | | | | | | |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Importance of Field study in Geology – Geological Mapping: Definition, types of maps (Topography, Cadastral, and Revenue), scale of the map, representative fraction, legends (geographical and geological), mapping techniques (Toposheet, satellite imagery, base map preparation) | 06 | CO1 |
| II | Field instruments: The Brunton compass, components of compass, taking bearing using compass and its uses. The Clinometer, components of clinometer, taking measurement using clinometer. Basic field equipment (geological hammer, pocket knife, hand lens, notebook, pen, marker, and sample bags) | 06 | CO2 |
| III | Geological sampling (minerals, rock, fossils, and waters samples): Aims and objectives of the field work, selecting the field area, types of sampling (Surface sampling. Channel/ Grooves sampling, Chip sampling, Grab sampling/Muck sampling, Wagon sampling, Bulk sampling, Core sampling, Sludge sampling), preparing sketches and taking photographs, recording the observations | 06 | CO3 |
| IV | Study of outcrops to distinguish between loose boulders and in-situ outcrops, importance of rock contacts, mapping by following rock contacts. Observations of contacts concealed under soil or vegetation (open wells, road cuttings, open quarry, open mines), determination of dip and strike of strata, field correlation. | 06 | CO4 |
| V | Preparation of a geological report: i) Compilation of field data, ii) Preparation of a report (quotations and | 06 | CO5 |

| | | | |
|---|---|---|---|
| | footnotes, illustrations, table of contents and index). | | |
| | **Total** | **30** | |
| **Text Books (Latest Editions)** | | | |
| 1. | Robert R. Compton, (1962). Manual of Field Geology.John Wiley & Sons, Inc., London | | |
| 2. | Frederick H. Lahee, (1917). Field Geology. New York: McGraw-Hill; London: Hill | | |
| 3. | Mukherjee A. K, (1990). Principles of Geology. E W Press, Kolkata | | |
| 4. | Marland, P. Billings, (2016), Structural Geology 3rd Edition, Pearson Education | | |
| 5. | Reed, J.S. &T.H. Wicander, Essentials of Geology, McGraw Hill., New York (2005) | | |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | | | |
| 1. | Gross, M. G. (1977). Oceanography: A view of the earth. | | |
| 2. | Principles of Geomorphology; William D. Thornbury, (2004) CBS Publishers and Distributors, New Delhi. | | |
| 3. | Gokhale N.W (2009). A Guide to Field Geology. CBS Publishers & Distributors, New Delhi | | |
| 4. | DeSitter, L. U. (1956). Structural geology, Mc Graw Hill, New York | | |
| 5. | Radhakrishnan, V, General Geology, V.V.P. Publishers, Tuticorin (1996) | | |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Field Techniques in Geology | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain geological mapping principles, map types, and field study techniques |
| CO2 | Apply field instruments and geological equipment for structural and field measurements |
| CO3 | Perform geological sampling, field observations, and documentation techniques |
| CO4 | Interpret geological outcrops, structural features, and prepare scientific geological reports |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

**Semester I**

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Foundation Course** | | Y | - | - | - | 2 | 2 | 25 | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | |
| CO1 | To understand the fundamentals, branches, and historical development of geology. | | | | | | | | | | |
| CO2 | To study Earth's position in space, geological time, and planetary systems. | | | | | | | | | | |
| CO3 | To understand Earth system components and atmospheric-oceanic interactions. | | | | | | | | | | |
| CO4 | To analyze hydrologic cycle, rock cycle, climate change, and related geological processes. | | | | | | | | | | |
| CO5 | To study geological time scale, fossils, and dating methods used in geology. | | | | | | | | | | |
| **Unit** | **Details** | | | | | | | **No. of Hours** | **Course Objectives** | | |
| I | Definition of Geology, various branches of Geology, Development of Geology. Place and Time: Latitude and longitude, determination of latitude and longitude. Concept of time and magnitude of geological time. The seasons and calendar, precession of the earth's axis. | | | | | | | 06 | CO1 | | |
| II | The solar system and planetary motion, major planet classifications and orbits. Earth as a system: Geosphere, Hydrosphere, Biosphere, Atmosphere and its interactions between them. | | | | | | | 06 | CO2 | | |
| III | Atmospheric circulation -Weather and climatic changes, Earth's heat budget, Oceanic current system, and effect of Coriolis force. Concepts of eustasy, Earth-Atmosphere-Ocean interaction, Wave erosion and beach processes. | | | | | | | 06 | CO3 | | |
| IV | Components of Hydrologic cycle, rock cycles and its process. Climate changes – Natural causes. | | | | | | | 06 | CO4 | | |
| V | Geological time scale, Fossils, types of fossils, basic concepts of relative and radiometric dating. | | | | | | | 06 | CO5 | | |
| | **Total** | | | | | | | **30** | | | |
| **Text Books (Latest Edition)** | | | | | | | | | | | |
| 1. | Shipman. J. T, Wilson J.D, Higgins C.A and Lou Bo (2021). An Introduction to Physical Science. Cengage | | | | | | | | | | |
| 2. | Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press. | | | | | | | | | | |
| 3. | Jerry Wilson, James Shipman and Charles Higgins (2015). An Introduction to Physical Science. Brooks/Cole, 14th Edition. | | | | | | | | | | |
| 4. | Todd, D.K. (2008). Groundwater Hydrology.5thed. Wiley. New Delhi. | | | | | | | | | | |
| 5. | Reed, J.S. &T.H. Wicander, Essentials of Geology, McGraw Hill., New York (2005) | | | | | | | | | | |
| **References Books (Latest edition, and the style as given below must be strictly adhered to)** | | | | | | | | | | | |
| 1. | Haydn A. "Chip" Fox (2021) Science in our Lives an Introduction to Physical | | | | | | | | | | |

| | |
|---|---|
| | Science. |
| 2. | James T. Shipman, Jerry D. Wilson, Charles A. Higgins and Omar Toores (2015) An Introduction to Physical Science. Books Cole Cengage learning. |
| 3. | National Geographic (2008) Introduction to Physical Science. McGrew-Hill Company. |
| 4. | Richard E. Chapman (2002) Physics for Geologists. CRC Press. |
| 5. | Radhakrishnan, V, (1996) General Geology, V.V.P. Publishers, Tuticorin. |


**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Foundation Course | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain the fundamentals, branches, and historical development of geology and geological time |
| CO2 | Describe the solar system, planetary motion, and Earth system interactions |
| CO3 | Analyze atmospheric circulation, oceanic processes, hydrologic cycle, and climate change |
| CO4 | Interpret geological time scale, fossils, and relative and radiometric dating methods |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

## SEMESTER - II

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Mineralogy and Crystallography** | Core | Y | - | - | - | 5 | 5 | 25 | 75 | 100 |
| **Course Objectives** | | | | | | | | | | | |
| CO1 | To understand the physical, chemical, and structural properties of minerals. | | | | | | | | | | |
| CO2 | To study the classification, composition, and occurrence of major rock-forming minerals. | | | | | | | | | | |
| CO3 | To understand the principles of optical mineralogy and the use of polarizing microscope. | | | | | | | | | | |
| CO4 | To study crystallographic principles, symmetry elements, and crystal morphology. | | | | | | | | | | |
| CO5 | To analyze crystal systems, crystal forms, and twinning in minerals. | | | | | | | | | | |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Mineralogy: Definition, Characters and Uses -Physical Properties of Minerals: Colour, streak, lustre, hardness, habit, cleavage, fracture, Odour, fluorescence and Phosphorescence, feel, tenacity, specific gravity, magnetism. Chemistry of minerals: general principals of chemical properties of minerals: atom, ions, molecules, atomic number, mass number, valence, ionic radii–bonding in minerals–atomic substitution and solid solution-Isomorphism, polymorphism and pseudomorphism. Classification of minerals: Classification schemes, Chemical Classification of Minerals, Structural classification of silicates. | 15 | CO1 |
| II | Rock Forming Minerals Group: Physical properties, chemical composition, classification, diagnostic properties and mode of occurrence of the following groups: Quartz, Feldspar, Feldspathoid, Amphibole, Pyroxene, Olivine, Mica and Garnet. | 15 | CO2 |
| III | Optical Mineralogy: Properties of Light: Nature of light-ordinary and plane polarised light- Light interaction with matter; reflection, defuse reflection, refraction, double refraction, refractive Index, total reflection, dispersion, relative retardation and birefringence. Polarising Microscope: Parts of polarising microscope and its uses - Study of optical properties of minerals: Optical properties under plane Polarised Light: Form, Colour, relief, Refractive Index, Cleavage, Inclusion and Alteration, Pleochroism, Twinkling. Optical properties between | 15 | CO3 |

| | | | |
|---|---|---|---|
| | cross nicol: Isotropism/Anisotropism, Interference colors, Extinction, Twinning, Zoning**.** Construction of Nicol prism-Preparation of Thin Section. | | |
| IV | Definition for crystal – Morphological characters of crystals – Faces – Forms – Edge, Solid angle – Interfacial angle – Uses of Contact Goniometer. Law of constancy of the Interfacial angles, Symmetry elements, crystallographic axes – Miller indices – Law of rational indices. Definition of Holohedral, Hemimorphic, Enantiomorphic and Hemihedral. | 15 | CO4 |
| V | Crystal Systems: Classification of crystal systems-Classification of crystals into seven systems. Morphological study of seven crystallographic systems with special reference to the elements of symmetry of their normal class. Cubic system–Normal (Galena type)-Tetragonal system – Zircon type - Hexagonal system – Beryl type - Trigonal system- Calcite type - Orthorhombic system – Barytes type - Monoclinic system – Gypsum type –Triclinic system– Axinite type. Twinning in crystals and its types. | 15 | CO5 |
| | **Total** | **75** | |
| **Text Books** | | | |
| 1. | Read, H.H. (1916). Routley's elements of Mineralogy, Thomas Murphy & co,. London. | | |
| 2. | Ford, W.E. (1988). Dana's Text book of Mineralogy. Wiley. New Delhi. (Reprint). | | |
| 3. | Deer, Howie and Zussman (1964). An introduction to rock-forming minerals. Orient Longman, London. | | |
| 4. | Naidu, P.R.J. (1967). Optical Mineralogy. | | |
| 5. | Introduction to Mineralogy by William D. Nesse, Edition: 2nd, Oxford University Press, 2012 | | |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | | | |
| 1. | Kerr, Paul. (1977). Optical mineralogy, McGraw hill, New York. | | |
| 2. | Mineralogy by Perkins, 3rd Ed, Pearson Education, India, 2015 | | |
| 3. | Manual of Mineralogy" by Klein C and Hurlbut C S, John Wiley and Sons Ltd, 1985 | | |
| 4. | Advanced Characterization of Industrial Minerals by G. Christdis, Mineralogical Society of Great Britain & Ireland. 2011 | | |
| 5. | Basics of Crystallography, Mineralogy and Geochemistry: A concise Text book by B.S.Rathore, Notion Press, 2021 | | |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Mineralogy and Crystallography | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain the physical, chemical, and structural properties and classification of minerals |
| CO2 | Identify and describe major rock-forming minerals and their occurrences |
| CO3 | Analyze optical properties of minerals using polarizing microscope techniques |
| CO4 | Interpret crystallographic principles, crystal systems, symmetry elements, and twinning in crystals |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:** 0 - No correlation 1 - Low 2 - Medium 3 – High

**Semester II**

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Mineralogy and Crystallography Practical** | Core | Y | - | - | - | 3 | 3 | 50 | 50 | 100 |
| **Course Objectives** | | | | | | | | | | | |
| CO1 | To identify and describe important silicate minerals using megascopic methods. | | | | | | | | | | |
| CO2 | To study the physical and diagnostic properties of major rock-forming mineral groups. | | | | | | | | | | |
| CO3 | To identify minerals microscopically based on optical properties. | | | | | | | | | | |
| CO4 | To understand crystal systems and morphological characteristics of important minerals. | | | | | | | | | | |
| CO5 | To study twinning in crystals and classify common twin types in minerals. | | | | | | | | | | |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Megascopic Identification and description of the following silicate mineral groups. Quartz and its varieties, Feldspar group, Feldspathoids. | 09 | CO1 |
| II | Megascopic identification and description of the following: Pyroxene group, Amphibole group, Epidote group, Mica group, Garnet group and Alumino Silicates. | 09 | CO2 |
| III | Microscopic identification and Description of the following: Quartz, Orthoclase, Microcline, Albite, Oligoclase, Labradorite, Nepheline, Leucite, Enstatite, Hypersthene, Glaucophane, Biotite, Muscovite, Olivine, Epidote, Garnet, Apatite, Zircon, Sphene, Tourmaline, Calcite, Andalusite, Kyanite, Sillimanite, Staurolite, and Cordierite. | 09 | CO3 |
| IV | Isometric System: Normal Class – Galena, Fluorite, Magnetite, Garnet, and Leucite, Copper- Pyritohedral class – Pyrite, Tetrahedral Class – Tetrahedrite. Tetragonal System: Normal Class – Zircon, Vesuvianite, Cassiterite, and Rutile. Tripyramidal – Scheelite, Meionite Sphenidal Class – Chalcopyrite. Hexagonal System: Normal Class – Beryl, Tripyramidal – Apatite, Hemimorphic – Zincite, Rhombohedral Normal – Calcite, Trapezohedral Class – Quartz. | 09 | CO4 |
| V | Orthorhombic System: Normal – Barite, Sulphur, Stibnite, Topaz, Staurolite, and Aragonite. Hemimorphic – Calymene, Sphenoidal Class – Epsomite. Monoclinic System: Normal – Gypsum, Pyroxenes and Amphiboles. Triclinic System: Normal – Axinite, Albite, and Rhodonite. | 09 | CO5 |

| | | | |
|---|---|---|---|
| | Twin Crystals: Contact and penetration twins of fluorite, Iron cross twin of pyrite, Knee type twin of cassiterite, Polysynthetic twin of aragonite, Cyclic twin of cerussite, Swallow tail of gypsum, Twins of Carlsbad, Baveno, Manebach, Albite law of Albite. | | |
| | **Total** | **45** | |
| **Text Books (Latest Editions)** | | | |
| 1. | Mineralogy – Dexter Perkins (2014), 3rd edition, Pearson New International Edition. | | |
| 2. | Principles of Geomorphology; William D. Thornbury, (2004) CBS Publishers and Distributors, New Delhi. | | |
| 3. | Agashe, S.N, Paleo botany, Oxford & IBH. Delhi(1995) | | |
| 4. | Stewart W.N. & G.W. Rothwell, Palaeobotany, Cambridge University Press. D 2005) | | |
| 5. | Moore R.C. et al., Invertebrate Fossils. CBS. Delhi (1952). | | |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | | | |
| 1. | Introduction to Mineralogy – William D. Nesse (2000), Oxford University press, New York. USA. | | |
| 2. | Textbook of Mineralogy – E.S. Dana, (2000), 3rd edition, CBS Publishers & Distributers, New Delhi. | | |
| 3. | Crystals and Crystal Structures – Richard J. D. Tilley (2006), John Wiley & Sons, England. | | |
| 4. | Introduction to Mineralogy, Crystallography & Petrology – Carl W. Correns (1967), 2nd edition, Springer | | |
| 5. | Colbert E.H. et al., Evolution of the Vertebrates, Wiley. New Delhi (2002) | | |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Mineralogy and Crystallography Practical | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Identify and describe silicate minerals using megascopic characteristics |
| CO2 | Analyze microscopic optical properties of minerals for mineral identification |

| | |
|---|---|
| CO3 | Interpret crystal systems, symmetry elements, and morphological features of crystals |
| CO4 | Classify and identify different types of crystal twinning in minerals |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

## Semester II

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Natural Hazards and Mitigation** | SEC | Y | - | - | - | 2 | 2 | 25 | 75 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the concepts, types, and causes of natural hazards and disasters. |
| CO2 | To study climatic, atmospheric, hydrospheric, and tectonic hazards and their impacts. |
| CO3 | To analyze earthquake, landslide, volcanic, tsunami, and marine hazards and mitigation measures. |
| CO4 | To understand disaster risk reduction, vulnerability assessment, and rehabilitation processes. |
| CO5 | To study the applications of Remote Sensing and GIS in hazard monitoring and disaster management. |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Introduction to natural hazards and disasters, historical background -The lithosphere and related hazards Atmospheric hazards, Hydrosphere and Related hazards, Human impact on natural disaster, Mitigating hazards, Plate tectonics and related hazards | 06 | CO1 |
| II | Climatical hazards – climate change – atmospheric circulation – Definition, types, causes, effects and preventing techniques of large scale and small scale storm hazards – drought hazards – flooding hazards. Fire related hazards | 06 | CO2 |
| III | Definition, types, causes, effects and prevention techniques of earthquake hazard, landslide hazards, volcanic eruptions and tsunami. Health and population related hazards. | 06 | CO3 |
| IV | Marine Hazards: Marine pollution, ocean wave hazards, sea ice hazards, sea level rise hazards, ocean morphological changes, beach erosion hazards, marine transport hazards, marine exploration hazards, and prevention techniques for marine hazards. | 06 | CO4 |
| V | Disaster management in India risk, Vulnerability and hazard mitigation through capacity building legislative responsibilities of disaster management; disaster mapping, assessment pre-disaster risk & vulnerability reduction, post disaster recovery, rehabilitation disaster related infrastructure development. Remote-sensing and GIS applications in hazards monitoring. | 06 | CO5 |
| | **Total** | **30** | |

| Text Books (Latest Editions) | |
|---|---|
| 1. | Monroe, J. S., Wicander, R., and Hazlett, R. (2007). Physical Geology: Exploring the Earth. Sixth Edition. |
| 2. | Strahler, A. Introduction to Physical Geology. Pub. John Wiley & Sons, Inc. page 632. |
| 3. | Hyndman, D., and Hyndman, D. (2011). Natural Hazards and Disasters. Third Edition. Pages 571. |
| 4. | Keller, E. D. (2012). Introduction to Environmental Geology. Printice Hall. Page 801. |
| 5. | Holmes, A & P. L. Duff. (1996). Principles of Physical Geology, 4th revised Edition, ELBS, London |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Natural Hazards and Mitigation | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain the concepts, causes, and classifications of natural hazards and disasters |
| CO2 | Analyze climatic, atmospheric, tectonic, and marine hazards and their environmental impacts |
| CO3 | Evaluate disaster mitigation, hazard prevention, and rehabilitation techniques |
| CO4 | Apply Remote Sensing and GIS techniques in hazard assessment and disaster management planning |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

## Semester II

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Remote Sensing and GIS** | SEC | Y | - | - | - | 2 | 2 | 25 | 75 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the basic principles, concepts, and applications of remote sensing. |
| CO2 | To study electromagnetic radiation, spectral signatures, remote sensing platforms, and sensor systems. |
| CO3 | To analyze aerial photographs, image interpretation techniques, and geological applications of remote sensing data. |
| CO4 | To understand the fundamentals, components, and coordinate systems of GIS. |
| CO5 | To study spatial and attribute data models and database management systems used in GIS applications. |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Remote sensing: Definition, Basic concepts and principles of remote sensing, advantages and limitations - components of remote sensing - Electromagnetic Radiation: Properties of EMR, Electromagnetic Spectrum – Atmosphere Interaction: Refraction, Scattering, and Absorption. Electromagnetic energy-Earth Interaction: Reflection, Transmission – Spectral signature: Spectral signature of vegetation, spectral signature of soil, Spectral signature of water, Spectral signature of minerals and rocks. | 06 | CO1 |
| II | Remote Sensing Platforms: Terrestrial Platforms, Airborne Platforms, Space borne Platforms- Types of Satellites: Astronomical Satellites, Communication Satellites, Weather Satellites, Earth Observation Satellites, Navigation Satellites, Reconnaissance Satellites - Orbits and their Types: Geosynchronous Orbit, Sun synchronous Orbit- Sensor System: Multi spectral Imaging Sensor System, Thermal Remote Sensing System, Microwave Imaging System -Image Resolution-Types of Image Resolutions: Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal Resolution. | 06 | CO2 |
| III | Aerial photographs – scales and types of aerial photographs - photo interpretation techniques – applications of aerial photographs. Mosaics: controlled and uncontrolled mosaics – advantage and disadvantages – application of mosaics in geology studies. Types of data products – types of image interpretation – basic elements of image interpretation – visual interpretation | 06 | CO3 |

| | | | |
|---|---|---|---|
| | keys. | | |
| IV | GIS definition - history of GIS – Components of GIS – Hardware, Software, Data, People and Procedure. – GIS sub systems - Data types: Spatial data: raster, vector, TIN – Nonspatial data. Coordinate systems: Geographic coordinate system, datum and map projection and its types, projected coordinate systems. | 06 | CO4 |
| V | Vector Data Model: Spaghetti Vector Model, Topological Vector Models. Raster data models: Simple Raster Arrays, Hierarchical Raster Structures, Types of Raster GIS Models, Compact Raster Data Models. Attribute data model: Hiearchial, network, relational and object-oriented model. Data Base Management System: functions of DBMS, components of DBMS, data file management: simple list, ordered sequential files, indexed files. | 06 | CO5 |
| | **Total** | **30** | |
| **Text Books (Latest Editions)** | | | |
| 1. | Curran, P. B. (1985). Principles of Remote Sensing. ELBS. London. | | |
| 2. | Lillisand, T. M & R. W. Kiefer. (2000). Remote Sensing and Image Interpretation. Wiley, Delhi. | | |
| 3. | Drury, S. D. (1993). Image Interpretation in Geology. Allen & Unwin. London. | | |
| 4. | Reddy, A. (2010). Principles of Remote Sensing and GIS. CBS. Delhi. | | |
| 5. | Miller, V. C. (1961). Photogeology. McGraw Hill. New York. | | |
| **References Books (Latest editions, and the style as given below must be strictly adhered to)** | | | |
| 1. | Pandey, S. N. (1989). Principles and Applications of Photogeology. Wiley Eastern. New Delhi. | | |
| 2. | Gupta, R. P. (1990). Remote Sensing Geology, Springer Verlag. | | |
| 3. | Benhardsen, T., (2002). Geographic Information Systems: an Introduction, John Wiley & Sons, New York. | | |
| 4. | Guha, P.K., (2008). Remote Sensing for the Beginner, Second Edition, East-West press pvt.ltd, New Delhi.178 pp. | | |
| 5. | Ian Heywood, Sarah Corrdius and Stevecarver, 2000. An introduction to Geographic Information system. Longman Ltd, New York. | | |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Remote Sensing and GIS | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain the principles of remote sensing, electromagnetic radiation, and spectral signatures |
| CO2 | Analyze remote sensing platforms, sensor systems, image resolutions, and satellite data |
| CO3 | Apply aerial photograph interpretation and remote sensing techniques in geological studies |
| CO4 | Interpret GIS concepts, spatial data models, coordinate systems, and database management systems |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High

**Semester II**

| Subject Code | Subject Name | Category | L | T | P | S | Credits | Inst. Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| | **Environmental and Engineering Geology** | Naan Mudh alvan | - | - | - | - | 2 | - | 0 | 100 | 100 |

| **Course Objectives** | |
|---|---|
| CO1 | To understand the concepts of environmental geology, ecology, and natural resources. |
| CO2 | To study environmental hazards related to geological processes and their mitigation measures. |
| CO3 | To analyze the impact of human activities on the geological environment and resource degradation. |
| CO4 | To understand the role of geology in civil engineering and engineering properties of rocks. |
| CO5 | To study geological investigations related to dams, tunnels, and coastal protection measures. |

| Unit | Details | No. of Hours | Course Objectives |
|---|---|---|---|
| I | Environmental Geology: Definition of ecology and environmental geology. Different ecosystems. Classification of Natural resources. A short account of renewable and non-renewable resources. Environmental problems due to surface geological processes, causes, hazards and remedial measures relating to landslides, floods, and soil erosion. | | CO1 |
| II | Influence of deep-seated geological processes – Hazards due to earthquake and reservoir induced seismicity. Hazards of volcanism. Techniques of prediction of volcano and human adjustments to volcanic environments. Benefits of volcanism. | | CO2 |
| III | Man as an agent of environmental modification. Environmental degradation due to mining and mineral processing – effects of urbanization on surface water, causes for groundwater pollution. Degradation of coastal environment and measures for coastal protection. Population explosion and their pressure on geological environments. | | CO3 |
| IV | Engineering Geology: The role of Geology in Civil Engineering. Engineering properties of rocks – strength and elastic properties. Properties of building stones. Causes of landslides and preventive measures. Geological investigations pertaining to the foundation of bridges, buildings and highways. | | CO4 |

| | | | |
|---|---|---|---|
| V | Dam-definition and types, geological investigations for dam site and reservoir. Tunnels-definition and types. Geological investigations for tunnelling. Problems related to tunnelling in hard and soft grounds and remedial measures. Coastal erosion and preventive measures. | | CO5 |
| | **Total** | | |
| **Text Books (Latest Editions)** | | | |
| 1. | Arthur, N. Strahler and Alan, H. Strahler, (1973). Environmental Geosciences: Interaction between Natural System and Man, Hamilton Publishing Co, Santa Barbara, California. | | |
| 2. | Kellar, E.A. (1979). Environmental Geology, Charless Merrill Publishing Co.ohio. | | |
| 3. | Subramanian, V. (2002). A Text book in Environmental Science, Narosa Publishing House, New Delhi. | | |
| 4. | Valdiya, K.S. (1987). Environmental Geology – Indian Context, Tata McGraw-Hill., New Delhi. | | |
| 5. | Krynine, D.P. and Judd, W.R. (2005). Principles of Engineering Geology and Geotechniques, McGraw Hill. | | |
| 6. | Narayanaswami, B.S. (2000). Engineering Geology, DhanpatRai&C.Delhi. | | |
| 7. | Parbin Singh, (2003). Engineering and general geology, S.K.Kataria and Sons, New Delhi. | | |

**1. PSO Mapping (Course vs PSOs)**

| Course Title | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 | Total Score |
|---|---|---|---|---|---|---|---|---|
| Environmental and Engineering Geology | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 17 |

**2. Course Outcomes (COs)**

| CO | Course Outcome Statement |
|---|---|
| CO1 | Explain ecological concepts, natural resources, and environmental hazards related to geological processes |
| CO2 | Analyze hazards caused by earthquakes, volcanism, mining, urbanization, and coastal degradation |
| CO3 | Evaluate engineering properties of rocks and geological investigations for civil engineering projects |
| CO4 | Apply geological principles in dam, tunnel, and coastal engineering studies and hazard mitigation |

**3. Mapping of COs with POs**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**4. Mapping of COs with PSOs**

| CO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | - | - | - |
| CO2 | 3 | 3 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 1 |

**Level of Correlation:**

0 - No correlation 1 - Low 2 - Medium 3 - High