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| B.Sc., APPLIED GEOLOGY |
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| **SYLLABUS** |
| **from the academic year****2023-2024** |

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| **TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005** |
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| **LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME** |
| **Programme:** | **B.Sc. APPLIED GEOLOGY** |
| **Programme Code:** |  |
| **Duration:** | **3 Years (UG)** |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study**PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.**PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.**PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation**PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team**PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.**PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.**PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.**PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.**PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling. |
| **Programme Specific Outcomes:** | On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:**PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.**PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively**PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.**PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.**PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.**PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field.  |

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| **PO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **PO1** |  |  |  |  |  |  |
| **PO2** |  |  |  |  |  |  |
| **PO3** |  |  |  |  |  |  |
| **PO4** |  |  |  |  |  |  |
| **PO5** |  |  |  |  |  |  |
| **PO6** |  |  |  |  |  |  |

**2. 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 during the second year vacation 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.
* Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
* State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest DBMS and Computer software for Analytics.

**ValueadditionsintheRevampedCurriculum:**

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| --- | --- | --- |
| **Semester** | **NewlyintroducedComponents** | **Outcome/ Benefits** |
| **I** | **FoundationCourse**To ease the transition of learningfrom higher secondary to highereducation,providinganoverviewofthepedagogyoflearningLiteratureandanalysingtheworldthroughtheliterarylensgivesrisetoanewperspective. | * Instill confidenceamongstudents
* Createinterestforthesubject
 |
| **I,II,III,IV** | **SkillEnhancementpapers**(Discipline centric /Generic/Entrepreneurial) | * Industry readygraduates
* Skilledhumanresource
* Studentsareequippedwithessentialskillsto

makethememployable |
| * Trainingonlanguageandcommunicationskillsenablethestudents gain

knowledge andexposureinthecompetitiveworld. |
| * Discipline centric skillwillimprovetheTechnical knowhow ofsolvingreallife

problems. |
| **III,IV,V& VI** | Electivepapers | * Strengthening thedomainknowledge
* Introducing thestakeholders to theState-of Arttechniquesfrom the streamsofmulti-disciplinary,crossdisciplinaryandinterdisciplinarynature
* Emerging topics inhigher education/industry/communicationnetwork/healthsectoretc.areintroducedwith

hands-on-training. |

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| **IV** | ElectivePapers | * Exposuretoindustrymouldsstudentsintosolutionproviders
* GeneratesIndustryreadygraduates
* Employmentopportunitiesenhanced
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| **VSemester** | Electivepapers | * Self-learning isenhanced
* Applicationoftheconcepttorealsituationisconceivedresulting

intangibleoutcome |
| **VISemester** | Electivepapers | * Enriches the studybeyondthe course.
* Developingaresearchframework and

presenting theirindependent andintellectual ideaseffectively. |
| **ExtraCredits:****ForAdvancedLearners/Honorsdegree** | * Tocatertotheneedsofpeerlearners/research

aspirants |
| **SkillsacquiredfromtheCourses** | Knowledge, Problem Solving, Analyticalability,ProfessionalCompetency,ProfessionalCommunicationandTransferrable Skill |

**Credit Distribution for UG Programmes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sem I** | **Credit** | **H** | **Sem II** | **Credit** | **H** | **Sem III** | **Credit** | **H** | **Sem IV** | **Credit** | **H** | **Sem V** | **Credit** | **H** | **Sem VI** | **Credit** | **H** |
| Part 1. Language – Tamil  | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | 5.1 Core Course –\CC IX  | 4 | 5 | 6.1 Core Course – CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course – CC XIV | 4 | 6 |
| 1.3 Core Course – CC I  | 5 | 5 | 2..3 Core Course – CC III  | 5 | 5 | 3.3 Core Course – CC V  | 5 | 5 | 4.3 Core Course – CC VII Core Industry Module  | 5 | 5 | 5. 3.Core Course CC -XI | 4 | 5 | 6.3 Core Course – CC XV | 4 | 6 |
| 1.4 Core Course – CC II | 5 | 5 | 2.4 Core Course – CC IV | 5 | 5 | 3.4 Core Course – CC VI | 5 | 5 | 4.4 Core Course – CC VIII | 5 | 5 | 5. 4.Core Course –/ Project with viva- voce CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific  | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific  | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific  | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific  | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific  | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific  | 3 | 4 | 6.5 Elective VIII Generic/ Discipline Specific  | 3 | 5 |
| 1.6 Skill Enhancement CourseSEC-1  | 2 | 2 | 2.6 Skill Enhancement CourseSEC-2  | 2 | 2 | 3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement CourseSEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific  | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course –SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education  | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
|  |  |  |  |  |  | 3.8 E.V.S. | - | 1 | 4.8 E.V.S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 |  |  |  |  |
|  | **23** | **30** |  | **23** | **30** |  | **22** | **30** |  | **25** | **30** |  | **26** | **30** |  | **21** | **30** |
| **Total – 140 Credits** |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System**

**for all UG courses including Lab Hours**

**First Year – Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 |  Language – Tamil  | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 |  Core Courses & Elective Courses [in Total] | 13 | 14 |
| Part-4 |  Skill Enhancement Course SEC-1  | 2 | 2 |
| Foundation Course | 2 | 2 |
|  |  | **23** | **30** |

**Semester-II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-2  | 2 | 2 |
| Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) | 2 | 2 |
|  |  | **23** | **30** |

**Second Year – Semester-III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) | 2 | 2 |
|  E.V.S  | - | 1 |
|  |  | **22** | **30** |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 |  English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 13 |
| Part-4 | Skill Enhancement Course -SEC-6 (Discipline / Subject Specific) | 2 | 2 |
| Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) | 2 | 2 |
|  E.V.S  | 2 | 1 |
|  |  | **25** | **30** |

**Third Year**

**Semester-V**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based | 22 | 26 |
| **Part-4** | Value Education  | 2 | 2 |
| Internship / Industrial Visit / Field Visit | 2 | 2 |
|  |  | **26** | **30** |

**Semester-VI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based & LAB | 18 | 28 |
| **Part-4** | Extension Activity | 1 | - |
| Professional Competency Skill | 2 | 2 |
|  |  | **21** | **30** |

**Consolidated Semester wise and Component wise Credit distribution**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parts**  | **Sem I** | **Sem II** | **Sem III** | **Sem IV** | **Sem V** | **Sem VI** | **Total Credits** |
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV**  | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Total** | 23 | 23 | 22 | 25 | 26 | 21 | **140** |

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

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| **MethodsofEvaluation** |
| **InternalEvaluation** | ContinuousInternalAssessmentTest | 25 Marks |
| Assignments |
| Seminars |
| AttendanceandClassParticipation |
| **ExternalEvaluation** | EndSemesterExamination | 75 Marks |
|  | Total | 100 Marks |
| **MethodsofAssessment** |
| **Recall(K1)** | Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions |
| **Understand/Comprehend(K2)** | MCQ,True/False,Shortessays,Conceptexplanations,Shortsummaryoroverview |
| **Application (K3)** | Suggestidea/conceptwithexamples,Suggestformulae, Solveproblems,Observe,Explain |
| **Analyze(K4)** | Problem-solvingquestions,Finishaprocedureinmanysteps,Differentiate |
|  | betweenvariousideas,Mapknowledge |
| **Evaluate(K5)** | Longer essay/Evaluationessay,Critiqueorjustifywithprosandcons |
| **Create(K6)** | Checkknowledgeinspecificoroffbeatsituations,Discussion,DebatingorPresentations |

**B.Sc. APPLIED GEOLOGYCOURSESTRUCTUREUNDERCBCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PART** | **SUBJECT** | **INSTRUCTION HRS/WEEK** | **CREDITS** | **UNIVERSITY****EXAMINATION** |
| **NTERNAL** | **XTERNAL** | **TOTAL** |
| **I** | Tamil or any other Language Paper –I | 6 | 3 | 25 | 75 | 100 |
| **II** | English - I CommunicativeEnglish | 6 | 3 | 25 | 75 | 100 |
| **III** | Core I - Geology Paper – I | 5 | 5 | 25 | 75 | 100 |
| Core II Geology Practical Paper –I\* | 5 | 5 | - | - | - |
| Elective Chemistry Paper–I(or)Allied Maths Paper –I | 4 | 3 | 25 | 75 | 100 |
| **IV** | Skill Enhancement Course | 2 | 2 | 25 | 75 | 100 |
| Skill Enhancement (Foundation Course | 2 | 2 |  |  |  |
|  |  | 30 | 23 |  |  |  |

**IISEMESTER**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PART** | **SUBJECT** | **INSTRUCTIONHRS/WEEK** | **CREDITS** | **UNIVERSITYEXAMINATION** |
| **NTERNAL** | **XTERNAL** | **TOTAL** |
| **I** | Language Tamil | 6 | 3 | 25 | 75 | 100 |
| **II** | English  | 6 | 3 | 25 | 75 | 100 |
| **III** | CoreIII–GeologyPaper– II | 5 | 5 | 25 | 75 | 100 |
| CoreIV-GeologyPracticalPaper –I\* | 5 | 5 | 40 | 60 | 100 |
| Elective Chemistry Paper–I(or) Allied Maths Paper–II | 4 | 3 | 25 | 75 | 100 |
| **IV** | Skill based Enhancement | 2 | 2 | 25 | 75 | 100 |
| Skill based Enhancement | 2 | 2 | 25 | 75 | 100 |
|  |  | **30** | **23** |  |  |  |

**III-SEMESTER**

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| --- | --- | --- | --- | --- |
| **PART** | **SUBJECT** | **NSTRUCTIONHRS/WEEK** | **CREDITS** | **UNIVERSITYEXAMINATION** |
| **INTERNAL** | **EXTERNAL** | **TOTAL** |
| **I** | Language Tamil  | 6 | 3 | 25 | 75 | 100 |
| **II** | English | 6 | 3 | 25 | 75 | 100 |
| **III** | CoreV- Geology Paper–III | 5 | 5 | 25 | 75 | 100 |
| Core VI – Geology Practical Paper–II\* | 5 | 5 | - | - | - |
| Elective Physics Paper –III | 4 | 3 | 25 | 75 | 100 |
| **IV** | Skill Enhancement | 1 | 1 | 25 | 75 | 100 |
| Skill Enhancement | 2 | 2 |  |  |  |
| E.V.S | 1 | - | 25 | 75 | 100 |
|  |  | 30 | 22 |  |  |  |

**IV SEMESTER**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PART** | **SUBJECT** | **INSTRUCTIONHRS/WEEK** | **CREDITS** | **UNIVERSITYEXAMINATION** |
| **NTERNAL** | **XTERNAL** | **TOTAL** |
| **I** | Language Tamil  | 6 | 3 | 25 | 75 | 100 |
| **II** | English | 6 | 3 | 25 | 75 | 100 |
| **III** | Core VII-Geology Paper–IV | 5 | 5 | 25 | 75 | 100 |
| Core VIII-Geology Practical Paper–II\* | 5 | 5 | 40 | 60 | 100 |
| Elective Physics Paper–II | 3 | 3 | 25 | 75 | 100 |
| **IV** | Skill Enhancement | 2 | 2 | 25 | 75 | 100 |
| Skill Enhancement | 2 | 2 | 25 | 75 | 100 |
| Environmental Studies  | **1** | 2 | 0 | 0 | 0 |
|  |  | **30** | **25** |  |  |  |

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| **PART** | **Semester V****SUBJECT** | **INSTRUCTIONHRS/WEEK** | **CREDITS** | **UNIVERSITYEXAMINATION** |
| **NTERNAL** | **XTERNAL** | **TOTAL** |
| **III** | CoreIX-GeologyPaper–V | 5 | 4 | 25 | 75 | 100 |
| CoreX-GeologyPaper– VI | 5 | 4 | 25 | 75 | 100 |
| CoreXI-GeologyPaper – VII | 5 | 4 | 25 | 75 | 100 |
| Project with Viva | 5 | 4 | 25 | 75 | 100 |
| Elective | 3 | - | - | - | - |
| CoreXIV-GeologyPractical–IV | 3 | - | - | - | - |
| **IV** | Skill based Elective course-V(Select any one from the list-1) | 2 | 2 | 25 | 75 | 100 |
| Skill based Elective course-VI(Selectanyonefromthelist-1) | 2 | 2 | 25 | 75 | 100 |

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| **VI SEMESTER** |
| **PART** | **SUBJECT** | **INSTRUCTIONHRS/WEEK** | **EXAMHRS.** | **CREDITS** | **UNIVERSITYEXAMINATION** |
| **NTERNAL** | **XTERNAL** | **TOTAL** |
| **III** | CoreXV-GeologyPaper–IX | 5 | 3 | 4 | 25 | 75 | 100 |
| CoreXVI-GeologyPaper–X | 5 | 3 | 4 | 25 | 75 | 100 |
| Core XVII -GeologyPaper–XI | 5 | 3 | 4 | 25 | 75 | 100 |
| Core XVIII -GeologyPaper–XII | 5 | 3 | 4 | 25 | 75 | 100 |
| CoreXIX-GeologyPractical-III\* | 3 | 3 | 4 | 40 | 60 | 100 |
| CoreXX-GeologyPractical-IV\* | 3 | 3 | 4 | 40 | 60 | 100 |
| **IV** | SkillbasedElectivecourse-VII(Selectanyonefromthelist-1) | 2 | 3 | 2 | 25 | 75 | 100 |

**TotalCredit=140Credits**

### B.Sc. APPLIED GEOLOGYSEMESTER-I

**COREI-PHYSICALGEOLOGYANDGEODYNAMICS21UGY01**

### COURSEOBJECTIVES:

1. GeologyisthestudyoftheEarthasawhole.
2. PhysicalGeologyintroducesdifferenttopicswhichdefinegeologyasabranchofPhysicalGeology.
3. The teaching and learning methodology involves class lectures, practicals and laboratorydemonstrations.Toimpartknowledgeofvarioustectonicfeaturesandtheirevolution.
4. Understandtheformationofcontinentandoceananddistributionofvolcanoesandearthquakes.

### PHYSICALGEOLOGY

**UNIT-I**

Geology: Scope and Importance, Branches of Geology. Steller System- Solar System:Planets, Satellites, Asteroids, Meteorites and Comets. Origin of the Earth: Theories ofOrigin - Nebular, Planetesimal, and Tidal Hypotheses – Earth in the SolarSystem: Size,Shape, Mass, Density, Rotational and Revolution parameters. Parts of the Earth -Lithosphere,Hydrosphere,Atmosphere,BiosphereandtheirComposition.

### UNIT-II

Age of the Earth: Age determination Methods:- Indirect method: Salinity method,Sedimentation Method, Tree-Ring or Growth rings, Lichenometric Method and DirectMethod:Ur-PbMethod,K-ArMethod,Rb-SrMethod,C14Method, InterioroftheEarth:StructureandCompositionofCrust,MantleandCore.

### UNIT-III

Earthquake: Definition, Focus, Epicenter. Measurement of Earthquake: Seismograph,Seismogram-Richter'sscale,Magnitude,Intensity.Earthquakebeltsoftheworldwithaspecial reference to India. Volcanoes: Definition, Types, Causes andEffects, VolcanicProducts, VolcanicLandforms,DistributionofVolcanoes, VolcanoesinIndia

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### GEODYNAMICS

**UNIT-IV**

Dynamic Earth: Isostasy, Orogeny and Epeirogeny. Origin and Evolution of Oceans,Geosynclines,Profileof Continental Margins,Island Arcs.Sub-Marine, Topographyfeatures,PrinciplesofGeodesy,Neotectonics.

### UNIT-V

ContinentalDrift,SeafloorSpreadingTheoryandEvidences:PlateTectonics

–ConvergentBoundaries,DivergentBoundaries,TransformBoundaries.OceanicTrenches,VolcanicArcs,Mid-OceanRidges,Paleomagnetismanditsapplication.

### TEXTBOOKS:

1. PorterandSkinner(1992),PrinciplesofPhysicalGeology,JohnWiley.
2. ArthurHolmes(1992),PrinciplesofPhysicalGeology,Vol.1,ChapmanandHall,London
3. Mahabathra,G.B.(1994),TextbookofPhysicalGeology,C.B.Spublishers,Delhi.
4. V.Radhakrishnan(1996),GeneralGeology,V.V.P.Publishers,Tuticorin.
5. ParbinSingh(2000),AtextbookofEngineeringandGeneralGeology,S.K.Katariaandsons,Delhi.
6. P.C.SanjeevaRaoandD.BhaskaraRao,TextbookofGeology2004,DiscoveryPublishing House,NewDelhi.
7. P.K.Mukerjee(1997),TextbookofGeology,WorldPress.

### REFERENCEBOOKS

PorterandSkinner1992PrincipleofPhysicalGeology,IVJohnWiley&sons.

### B.Sc. APPLIED GEOLOGYSEMESTERII

**COREII-GEOMORPHOLOGYANDSTRUCTURALGEOLOGY21UGY02**

### COURSEOBJECTIVE:

1. Thedynamic instabilityof thelithosphere, continuous and discontinuousdeformationtakes placewithintherocksinsolidorsemi-solidstate.
2. To decipher the fundamentals of structures and the underlying physical processesof rockdeformationandgeotectonicstounderstandlandformsandtheirevolution.
3. Toeducatethestudentsabouttheconceptrock deformation.
4. Tounderstandqualitativeaspectsofbrittleandductiledeformationprocesses,anddescriptiveanalysis.

### GEOMORPHOLOGY

**UNIT-I**

Meaning - Scope - Geomorphic Processes: Internal and External Processes - Diastrophismand Denudation, Internal Process - Faults, Folds and Cracks, Volcanism and Earthquakes:Types and Distribution. External Processes- Weathering: Physical, Chemical andBiological.MassWasting:SoilCreep,Landslide,Rockfall,RockslipandMudflow.

### UNIT-II

**Geological Work of River:** Sources of Stream Water – River Profile – Geological work –Methods of river Erosion – Rate of River Erosion – Features of Stream Erosion –Sediment Transport by River, Deposition by River. Drainage Patterns and its types.MajorRivers inIndia.

**Lakes:**Description,classification,Origin,Geologicalfunction,DistributionandIndianlakes.

**GeologicalWorkofGroundwater:**Description,ChemicalWorkofGroundwater,

DepositionbyGroundwater,MechanicalworkofGroundwater.

**Geological Work of Wind:** Wind Erosion and its Landforms, Sediment Transport byWind and its Landforms, Deposition by Wind and its Landforms - Sand Dunes and theirTypes.

### UNIT-III

**GeologicalWorkofGlaciers:**GlacialMorphology–TypesofGlaciers

–GeologicalWorkofGlaciers–GlacialErosion–RateofGlacialErosion–FeaturesofGlacial Erosion – Glacial Transport and Glacial Deposits – Morphological notes onGlacial Deposits.

**GeologicalWorkofSea:**DefinitionofContinentalShelf,ContinentalSlope,AbyssalPlain,Continental Rise and Sub-Marine Canyons. Marine Erosion and Features of MarineErosion – Marine Deposition – Coral Reefs.Applied Geomorphology: Application invariousfieldsofEarthScienceMineralProspecting,Geohydrology,CivilEngineeringand EnvironmentalStudies,GeomorphologyofIndia.

### STRUCTURALGEOLOGY

**UNIT-IV**

Introduction and Scope of Structural Geology. Introduction of Topographical andGeological Map and Map Scale, Outcrop, Configuration of Rocks – Igneous SedimentaryRocks - Principle of Geological Mapping, Map Reading, Projection Diagrams. ShearZones: Brittle and Ductile Shear zones, Geometry and Products of Shear Zones; Stress-StrainRelationshipsforElastic,PlasticandViscousMaterials.

MeasurementofStraininDeformedRocks.BehaviourofMineralsandRocksunderDeformationConditions.

### UNIT-V

**Folds:** Definition- Parts of Folds -Types of Folds-Classification of Folds- Recognition ofFolds.

**Faults:**Definition-TypesofFaults-ClassificationofFaults-RecognitionofFaults.

**Joints:**Definition-TypesofJoints-ClassificationofJoints.

**Unconformity:** Definition-Types-Recognition of Unconformities-Distinguishing Faultsfrom Unconformity. Superposed Deformation.Mechanism of Folding, Faulting andProgressiveDeformation.OriginofLineationandFoliation.

### TEXTBOOK:

1. RichardHuggett,(2007),FundamentalsofGeomorphology.IIEdition.RoutledgeN.Y.
2. Ritter,D.F.,Kochel,R.C.,Miller,J.R.,(2002),ProcessGeomorphology,Wavelandpress.
3. H.S.Sharma(1990).IndianGeomorphology.ConceptPub.Co.,NewDelhi.
4. Robert, S.A. and Suzanne, P.A. (2010), Geomorphology – The mechanics andchemistryoflandscapes. CambridgeUniversityPress.
5. Thornbury,W.D.,(2004),PrinciplesofGeomorphology,IIEd.WileyEasternLtd.NewDelhi.
6. Billings,M.P.StructuralGeology:PrenticeHall,EnglewoodClifts,U.S.A.
7. Novin,C.M.PrinciplesofstructuralGeologyJohnWilley,NewYork.
8. Gokhale,N.W.TheoryofStructuralGeology,CBSPublishers.

### REFERENCEBOOK:

1. V.V.Belousov-StructuralGeology,Moscow
2. P.C.Bedgley-StructuralandTectonic,Principles:Harper&Row,NewYork.
3. E.W.Spencer-AnIntroductiontostructuralGeology:McGrawHill,NewYork.
4. Park,P.G.-Fundamentals ofstructuralGeology,JohnWilley&Sons.

### B.Sc. APPLIED GEOLOGYSEMESTERII

**COREPRACTICALI-STRUCTURALGEOLOGYANDSURVEYING21UGYP01**

### STRUCTURALGEOLOGY

ContourMapsandtheirInterpretation.ExercisestoPredictTrendsoftheOutcropofHorizontal, Vertical an Incline Beds with Respect to Topography – Reading of solidconformable maps – Deciphering Dip and Strike of Outcrops – Construction of map whenthree points over a bedding plane are given - Constructionof vertical sections order ofsuperposition–Verticalthicknessofformations.

Reading of solid fold and fault maps construction of vertical sections –Determination of throw of vertical faults. Reading of unconformable solid maps –Constructionofsections.Readingofsolidmapsofareaswhenmorethanonestructureisinvolved – Determination of comparative ages of structures and intrusions - Geologicalhistory.

Determinationoftruedip&apparentdipandthicknessbycalculationandgraphicalmethod.

DescriptionoffeaturesinSurveyofIndia's(SOI)Toposheet:Extramarginal,marginal,intra marginal information, major conventional signs and symbols, physicaland socio-culturalfeatures.

### SURVEYING

Chain surveying: Open traverse and closed traverse. Prismatic compass surveying:Determination of the distance between two inaccessible stations. Radiation method,method of Intersection– Plane table surveying: Determination of the distance between twoinaccessible stations. Radiation method, method of Intersection – Leveling: Rise and fallmethod-ClinometerCompassandBruntonCompass: Tofind out dip and strike of thebeds.GPS:Fundamentalsandapplications.

### B.SC. APPLIED GEOLOGYSEMESTER-III

**CORE III - PALAEONTOLOGY21UGY03**

### COURSEOBJECTIVES:

1. Tomaketheparticipanttoacquireknowledgeonancientlife,skillsonidentificationanddocumentationofpaleontology.
2. Theknowledgeinpalaeontologyistoequipthestudentsforunderstanding.
3. To educate various aspects biological events such as origin of life, evolution, massextinctions, radiations, paleo-ecology, exceptional preservation, and functionalmorphology.
4. To prepare the students for professional job perspective in the field of basicpalaeontologicalresearch,tobenefittheminthepreparationofvariousexam.

### UNIT-I

Definition of Palaeontology –Scope of Paleontology- Geological Time Scale.Definition offossils – Types of fossils -Nature and Modes of Preservation of fossils:Body fossils andUnaltered hard parts, Altered hard parts, Petrification, Permineralisation, Carbonization,Mould and Casts, Tracks, Trails, Borings. Uses offossils – Stratigraphic Indicators –ClimaticIndicators-IndicatorsofPaleogeography

Indicators of Evolution and Migration of life forms –Indicators of New deposits ofCoaland Petroleum – Life through ages. Significance of Fossils-Introduction toChronostratigraphy-Lithostratigraphy –Biostratigraphy.

### UNIT-II

**InvertebratePalaeontology:PhylumMollusca:**Class**Pelecypoda**-Generalmorphology

– Dentition type - Shell form - Ornamentation, Classification, Geological history. Class**Gastropoda:** General morphology -Types of coiling – Dextral and Sinistral – Shell form-Ornamentation, Classification, Geological history. Class**Cephalopoda**: Sub Class:Nautiloidea, Ammonoidea - General morphology - Patterns: Nautilitic, Goniotitic,Ceratitic and Ammonitic – Shell forms – Ornamentation – Classification, GeologicalhistoryandColeoidea–MorphologyandGeologicalhistoryofa Belemniteshell.

### UNIT-III

**PhylumArthropoda:**Class–**Trilobita**-GeneralMorphology:ClassificationGeologicalhistoryand.PhylumPorifera–Ashortaccountofsponges.

Phylum **Coelentrata** – Class **Anthozoa** –General Morphology- Shapes ofCorals -Classification–Geologicaldistribution.

Phylum **Hemichordata** – Class **Graptozoa**–General Morphology,Classification,Geologicaldistribution.

### UNIT-IV

**Phylum Brachiopoda:** General morphology – Shell forms - Ornamentation,Classification,GeologicalhistoryDistinguishbetweenLamellibranchesandBrachiopods.**Phylum Echinodermata:** Class **Echinoidea**: General morphology: Periproct,Corona,Peristome. Classification – Regular and Irregular Echinoids and Geological history. Class**Crinoidea-** Morphology- Geological history. Class**Blastoidea**-Morphology- Geologicalhistory.

### UNIT-V

**Phylum Protozoa** –Class **Sarcodina:** Order **Foraminifera**: General morphology –Dimorphism-Formsof Foraminiferaltests-Ornamentation-Geologicalhistory.

**Phylum Arthropoda -** Class **Crustacea:** Sub-Class: **Ostracoda** – Morphology –ClassificationandGeologicalhistory.

**Vertebrate Palaeontology**: Classification of Animal kingdom - Habitats and Habits ofanimals-A brief outline of the Classification of Vertebrates – Evolution of Fishes, Horses,ElephantsandMan. Dinosaurs–Evolution andExtinctionofDinosaurs.

**Paleobotany**: General classification of Plant kingdom – Gondwana Indian Plant fossils –AbriefaccountofthefollowingPlantfossils:Glossopteris,Gangamopteris,Ptilophyllum,Calamites, Lepidodendron and Sigillaria. Introductionto Spores and Pollens.SignificanceandPaleoclimaticconditionsofGondwanaflora.ApplicationsofMicropalaeontology.

### TEXTBOOKS

1. HenryWoodsInvertebratepalaeontolgy–Cambridge.
2. Romer,A.S.Vertebratepalaeontology,Chicagopress.
3. Arnold,C.A.AnintroductiontoPalaeobotany.,MC-GrawHill.
4. B.U. Hag and A. Boersma (1978), Introduction to marine Micropalaeontology,Elsevier,Netherlands
5. Jain,P.C.andAnatharaman,M.S.AnintroductiontoPaleontology,VishalPublications.

### REFERENCEBOOKS

1. Raup,D.M.andStanely,M.S.PrinciplesofPalaeontology,CBSPublishers.
2. Moore,R.C.,Laliker,C.G.&Fishcher,A.G.InvertebrateFossils,Harperbrothers
3. Shrock,R.R.andTwenhofel,W.H.(1953),PrinciplesofinvertebratePalaeontology,AmoldpublicationEaston.

### B.Sc.APPLIEDGEOLOGYSEMESTER-IV

**COREIV–STRATIGRAPHY21UGY04**

### COURSEOBJECTIVE:

1. TounderstandbasicknowledgeaboutIndianStratigraphy.
2. Totrainthestudentstounderstand theprocessesofformationsoftimescalestratigraphyandsignificanceof fossils.

### UNIT-I

Stratigraphy-Definition-Principles of Stratigraphy: Law of Superposition,Uniformitarianism,Faunalsuccession,CorrelationandContemporaneous.GeologicalTimescale and their Divisions.Stratigraphic Unit.Homotaxis, Homotaxial andSynchronousBeds.PhysiographicdivisionsofIndia,

### UNIT-II

Precambrian Stratigraphy: Archean of Dharwar Province, Archean of Singbhum - Orissa,Archean of Eastern Ghats, Archean of Aravalli, Archean of TamilNadu – SathyamangalamGroup, Bhavani Gneissic Complex, Anorthosite Complex.Mineral Wealth of ArcheanIndia,TheEp-archeanunconformity,StratigraphyofCuddapah-EconomicmineralsofCuddapah System and VindhyanSystem – KurnoolGroup–EconomicmineralsofVindhyanSystem.

### UNIT-III

Palaeozoic Stratigraphy: Distribution of Palaeozoic rocks in India, Cambrian,CarboniferousandPermianofSaltRange,PalaeozoicofKashmirValley.PalaeozoicofSpitiValleyand PaleozoicrocksofPeninsularIndia.

### UNIT-IV

MesozoicStratigraphy:ImportanceofGondwanaSuperGroupandGondwanaPlantbedsin Tamilnadu. Triassic of Spiti, Kashmir- Salt range-Jurassic of Cutch, Cretaceous ofTiruchirappalli and Narmada Valley–Thiruvakkarai Wood Fossil, Pondicherry. Age ofDeccantraps–BaghBeds–LametaBeds.

### UNIT-V

Cenozoic Stratigraphy: Geological Event during Cenozoic Era, Rise ofHimalaya,Neogene of Siwalik System. Tertiary of Assam-Karewa formation, Tertiary rocks ofTamilNadu-CuddaloreSandstone,ImportanceofSivapithecus,RamapithecusApes.PleistoceneGlaciations-MineralWealthofTertiaryrocksofIndia.

### TEXTBOOKS

1. Krishnan,M.S.(2003),GeologyofIndiaandBurma,6thEdition,CBS.
2. Wadia,D.N.(1953),GeologyofIndia,TATAMcGraw–Hill.
3. Ravindrakumar,K.R.StratigraphyofIndia.
4. Lemon,R.Y.(1990),PrinciplesofStratigraphy,MerrillPublishingCo.

### REFERENCEBOOKS

1. Pascoe,E.H.(1968) -A manualoftheGeologyIndiaandBurma,Govt.ofIndiaPublications.
2. Gregory,J.W.andBarretB.H-GeneralStratigraphy.

### B.Sc.APPLIEDGEOLOGYSEMESTER-IV

**CORE PRACTICAL PAPER-IIPALAEONTOLOGYANDSTRATIGRAPHY-21UGYP02**

### PALAEONTOLOGY

Megascopicidentificationanddescriptionofthefollowingfossils:

**Pelecypoda:**Arca,Meretrix,Pecten,Cardita,Alectryonia,Spondylus,Inoceramas,Gryphaea,Exogyra,Radiolites,Ostrea,Unio,Venus,Cardium.

**Gasteropoda**:Natica,Turbo,Trochus,Turritella,Cerethium,Conus,Voluta,Murex,Fusus,Physa,Bellerophon.

**Cephalopoda**:Nautilus,Goniatites,Ceratites,Acanthoceras,Scholenbachia,Perispinctus,Hamites, Scaphites, Baculites, Turrilites and Belemnites. **Echinodermata**: Pentrimites,Cidaris,Hemicidaris,Micraster,Holaster,Hemiaster,Stygmatophygus.

**Arthropoda**:Trilobita:Paradoxides,Calymene,Phacops.Trinucleus.**Brachiopoda**:Spirifer,Productus,Terebratula,Rhynconella, Atrypa,Athyris,Orthis.

**Graptolites**:Phyllograptus,Tetragraptus,Didymograptus,Diplograptus,Monograptus.

**Corals**:Calceola,Zaphrenitis,Favosites,Halysites**.**

**Plant fossils:** Glossopteris, Gangamopteris, Ptillophyllum, Lepidodendron, SigillariaandCalamites.

**Micro Fossils:** Lagena, Nodosaria, Textularia, Operculina, Elphidium, Ammonia.**Diagrams :**Paradoxides,Pentremites,Trigonia,Arca,Meretrix,Murex,Turritella,Nautilus,Spirifer.

### STRATIGRAPHY

**Stratigraphy-**ArrangingthedifferentIndianStratigraphichorizonsinaccordancewithage,Stratigraphicposition,Fossilcontentand OrderofSuperposition.

### B.Sc.APPLIEDGEOLOGYSEMESTER-V

**COREV–CRYSTALLOGRAPHY21UGY05**

### COURSEOBJECTIVE:

1. The course’s specific aim is to acquaint students about Crystal structures andtheirclassificationintounit systemsandsymmetryclasses.
2. ToacquaintstudentsaboutvariouslawsofcrystallographygoverningtheconsistencyofCrystal structures with respect to specific chemical composition. 3.To introduce how dominerals form. To explain chemical composition, bondingand internal structure ofminerals.

### UNIT-I

DefinitionofCrystal–MorphologicalCharactersofCrystal–Faces–Forms–Edges,Solidangles – Interfacial angle. Contact Goniometer and its uses. Symmetry Elements–Crystallographic axes –Crystal notation – Parameter system of Weiss andMiller indices –axial ratio – laws of crystallography – The law of constancy of symmetry, the law ofconstancy of interfacial angles andthelawof rationalindices.Symmetry in General -Planes of Symmetry - Axes of Symmetry - Centre of Symmetry–RelationofGeometricalto Crystallographic symmetry - Pseudo symmetry - Crystallographic axes - Systems ofcrystallization.

### UNIT-II

CrystalsForms-IntroductionofHolohedral,Hemihedral,HemimorphicandEnantiomorphic.

**Isometric System:** Normal, Pyritohedral, Tetrahedral, Plagiohedral classes withreferencestowell-developedcrystalsofGalena,Spinel,Garnet,Fluorite,Diamond,Pyrite,Tetrahedrite,Boracite,andCuprite.

**Tetragonal System:** Normal, Hemimorphic,Tripyramidal,Pyramidal - HemimorphicSphenoidal, Trapezohedral ,Tetratohedral classes with references to well-developedcrystals of Zircon, Rutile, Casseterite, Vesuviante, Apophyllite, Shellie, Melonite,WulfeniteandChalcopyrite.

### UNIT-III

**HexagonalSystem:**HexagonalDivision:Normal,Hemimorphic,

Tripyramidal, Pyramidal, Hemimorphic ,Trapezohedral classes with references to well-developedcrystals:Beryl,Zincite,ApatiteCalcite,Corundum,Tourmaline,PhenaciteandQuartz.Rhombohedral Division: Rhombohedra, Rhombohedral-hemimorphicTrirhombohedral,Trapezohedral classes.

### UNIT-IV

**OrthorhombicSystem:**StudyoftheSymmetryelements,FormsandtypicalmineralsofNormal, Hemimorphic and Sphenoidal classes with special reference to well-developedcrystalsofBarite,OlivineTopaz,Staurolite,Sulphur,Calamine,StruviteandEpsomite.

**MonoclinicSystem:**StudyoftheSymmetryelementsandFormsoftheNormalclass.

**TriclinicSystem:**StudyoftheSymmetryelementsandForms oftheNormalclass.

### UNIT-V

Twinning : Definition – Evidence of Twinning- Laws of Twinning- Composition plane-Twinning plane - Twinning axis –Types of twinning - Simple Repeated (Polysynthetic)ContactandPenetrationtwinning–SecondaryTwinning.

### TEXTBOOKS

1. Dana,F.S.(1955),Atextbookofmineralogy-AsiaPublishingHouse-Willey.
2. Wade,F.A.&Mattox,R.B.Elementsofcrystallographyandmineralogy,HarperBros(1960).
3. Phillips,P.C.(1956),AnintroductiontocrystallographyLongmansgreen&co.,
4. Kerr.P.F.OpticalMineralogy.

### REFERENCEBOOKS

1. Phillips,W.R.OpticalMinerlogy,GriffenD.T.(1986).
2. Walhstrom,E.F.(1960),Opticalcrystallography–JohnWiley.
3. Winchel,A.N.(1968),Elementsofopticalmineralogy,part1&2WileyEastern.
4. SmithH.G.Mineralsundermicroscopy–Murby.

### B.Sc.APPLIEDGEOLOGYSEMESTER-V

**COREVI–MINERALOGY21UGY06**

### COURSEOBJECTIVES:

1. Tostudythephysicalchemicalandopticalpropertiesofrockformingminerals.Thecoursewill lay the foundation for the broader understanding of the geology by imparting thebasicknowledgeabouttherockformingminerals.
2. Tolearnaboutmineralstheirformation,complexity,association,identificationofthebasicideaofmineralinteraction.

### UNIT-I

Definition of Mineral and Mineraloid, Scope of Mineralogy, Properties of minerals:Physical,Chemical,Optical.

PhysicalPropertiesofminerals:Basedoncohesion:Form,structure,Cleavage,Hardness,Fracture,Tenacity,Specificgravity.Jollybalance and beambalance.

BasedonLight:Colour,Streak,Lustre,Transparency,Fluorescence,Phosphorescence.Based onHeat:Electricity,and Magnetism.

BasedonSenses:Taste,Odour,feel.

ChemicalPropertiesofminerals:Isomorphism,PolymorphismandPseudomorphism.Outlineofblowpipetests.

### UNIT-II

Mineralogy,Structure,ChemicalComposition,OpticalandPhysicalProperties,ModesofOccurrence and Industrial uses of the following group of minerals: **Quartz Group:**Description, General Characteristics, Crystalline Varieties, Cryptocrystalline Varieties,AmorphousVarieties.

**Feldspar Group:** Introduction, Crystal System.AlkaliFeldspar:Orthoclase,Microcline,Perthite.PlagioclaseFeldspar:PlagioclaseSeries.

### UNIT-III

Mineralogy, Structure, Chemical composition, Optical and Physical properties,Modes ofOccurrence and Industrial uses of the following group of minerals: **Feldspathoid Group:**Leucite,Nepheline,Cancrinite,Sodalite, Hauynite,Noselite,Lazurite.

**Pyroxene Group:** Orthopyroxene, Clinopyroxene, Clinoenstatites, Pigeonite, Diopside-Hedenbergite,Augite, Wollastonite,Agerite,Jadeite, Spodumene,Rhodonite.

### UNIT-IV

Mineralogy,Structure,Chemicalcomposition,OpticalandPhysicalProperties,Modesofoccurrence and Industrial uses of the following group of minerals: **Amphibole Group:**Anthophyllite,Cummingtonite,Tremolite, Actinolite,Hornblende,Barkevekite,Glaucophane,Ribeckite,Arfvedsonite.

Mineralogy,Structure,Chemicalcomposition,OpticalandPhysicalProperties,Modesofoccurrence and Industrial uses of the following group of minerals: OlivineGroup , Micagroup,GarnetGroupandZeoliteGroup.

### UNIT-V

**OpticalMineralogy:** Opticalsystem-light–ordinarylight,polarisedlight.Thepartsof

Polarizing Microscope. Refraction: Snell’s law. Optical properties of minerals: Refractiveindex (RI)Dispersion-total reflection-birefringence, Isotropic and Anisotropic, DoubleRefraction,UniaxialandBiaxialMinerals,OpticalIndicators-Opticaxis–Opticalsign.

### TEXTANDREFERENCEBOOKS:

1. Berry,L.G.,Mason,B.H.andR.V.Dietrich(1983),Mineralogy:Concepts,Descriptions,Determinations.W.H.Freeman& Co.,612p.
2. Dana,E.S.(2011),AText-BookofMineralogy,ReadBooksDesignPublishers,London.
3. Dana,J.D.(2012),ManualofMineralogy,MerchantBooksPublishers,NewYork.
4. Erni,H.(2010),MineralogySimplified,ForgottenBooksPublishers,London,436
5. Mason,B.andBerry,L.G(1978),ElementsofMineralogy,W.H.Freeman&Co.
6. Nesse,W.D.(2014),IntroductiontoMineralogy,OxfordUniversityPress,USA.
7. PaulF.Kerr(1984),OpticalMineralogy,McGraw-hillbookcompanyNewYork.

### B.Sc. APPLIED GEOLOGYSEMESTER-V

**COREVII-IGNEOUSPETROLOGY21UGY07**

### COURSEOBJECTIVE:

1. Tounderstandcharacteristics andgenesisofIgneousrocks.
2. Tounderstandigneousprocesses,physicalandchemicalcharacteristicsofmagmaandvarious rock types its geological setting, petrogenesis, classification, and naturalcharacteristics,texturesandstructures.
3. Toidentifymineralassemblages,texturalandchemicalcompositionofmineral.

### UNIT-I

Introduction to Petrology – Igneous Rocks-Magma- Definition, Types and Origin:Basaltic,Andesitic,Rhyoliticmagma–RockCycle-Plutonic,HypabyssalandVolcanicrocksformation-CompositionandConstitutionofmagma-PrimaryandParentalmagma.Forms of Intrusive igneous rocks: Concordant and Discordant forms-Forms of Extrusiveigneousrocks.

### UNIT-II

Textures:Definition-Types:Crystallinity,Crystallites,Microlites,Devitrification,Granularity.

Shape of Crystals – Equigranular Texture: Allotriomorphic, Hypidiomorphic,Panidiomorphic,Microgranular,Orthophyric,Felsitictexture.InequigranularTexture:Porphyritic,Poikilitic,Ophitic,Intergrowth,Directiveovergrowth,Reactiontexture.

Structures:Definition-Types:VesicularandAmygdaloidal,Blockylava,Ropylava,Pillowstructure, Flow structure, Sheet joints, Mural joints, Columnar joints, Rift andGrain,ReactionRims,Xenolithicstructure.

### UNIT-III

Physical properties of magma: Crystallization of Unicomponent magma- Binary magma:(Di-An)Eutecticsystem,(Al-An)Solidsolutionsystem–Ternarysystem(Ab-An-Di).

Bowen reaction series, Diversity of Igneous rocks – Magmatic differentiation: Fractionalcrystallisation,Liquidimmiscibility,Assimilation.

### UNIT-IV

Classification of Igneous Rocks: CIPW classification, Mineralogical classification,Megascopic (or) field classification, Tyrrell tabular classification, - Classification basedontheAlkalitoPlagioclasefeldspar.

### UNIT-V

Petrography and Petrogenesis of the following Acid and Intermediate rocks: Granite,Granodiorite, Syenite, Diorite, Rhyolite, Dacite, Trachyte, Andesite, Pegmatite andAplite. Basic, Ultrabasic and Ultramafic rocks: Gabbro, Dolerite, Basalt – Monomineralicrocks:Dunite,Pyroxenite,Anorthosite.

### TEXTANDREFERENCEBOOKS

1. Tyrrell,G.W.(1978),Theprinciplesofpetrology–Chapmanand HallLtd.,London.
2. Bowen,N.L.TheEvolutionoftheIgneousRocks–Doverpublication,Inc,NewYork.
3. Barth,FW.(1962),Theoriticalpetrology-Wiley.
4. Walstrom,E.E.(1961),TheoriticalIgneouspetrology,Wiley.
5. Turner, F.J. and Verhoogen. J (1960), - Igneous and Metamorphic petrology –McGrawHill.
6. Hatch, F.H.Wells,A.K.(1949),PetrologyofIgneousRocks,ThomasMurby&Wells,
7. Johannesen,A(1962)DescriptivepetrographyofIgneousRock.

### B.Sc. APPLIED GEOLOGYSEMESTER-V

**CORE-VIIISEDIMENTARYANDMETAMORPHICPETROLOGY21UGY08**

### COURSEOBJECTIVE:

1. Toimpartknowledgeofformationofsedimentaryrocks.
2. Totrainthestudentstounderstandthemodeofformations,transportationanddepositionofthesedimentsandalsoabouttheprocessesmodifyingthesedimentsaftertheirburial.
3. Toinferthemetamorphicagents,kindsandformationofmetamorphicrocks.
4. To understand implications of various physic-chemical parameters in formulatingmetamorphichistoryof rocks

### SEDIMENTARYPETROLOGY

**UNIT-I**

**Sedimentary Formation:** Description and formation of Sedimentary Rocks- Mechanicaldeposits, Chemical deposits, Organic deposits and Pelitic deposits **EnvironmentalFormation**:Facies-Continental-Transitional-Marine. Sedimentary Process: Weathering-Disintegration and Decomposition,Erosion,Transportation,Deposition, LithificationandDiagenesis.

### UNIT-II

**Sedimentary Classifications:** Brief study of F.J. Pettijhon and Tyrrell classification ofsedimentaryrocksintoResidual,Mechanical,ChemicalandOrganicdeposits.**TexturesofSedimentary Rocks:** Origin of grains, Size, Shape, Packing, Fabric and Crystallization ofgrains.**StructuresofSedimentaryRocks:**Mechanical,Chemical,Organical.

### UNIT-III

Petrographic details of important Silicic and Carbonate rocks such as- Conglomerate,Breccia, Shale, Sandstone, Clay, Limestone, Dolomite, Coal-Iron oresof SedimentaryOrigin-Gypsum-Rocksalt-Flint-Chert and Phyllite. Sedimentary Basins of India andTamilnadu.

### METAMORPHICPETROLOGY

**UNIT-IV**

Definition, Agents and Kinds of Metamorphism –Metamorphic Grade, Zone, Facies.TexturesandStructuresofMetamorphism.ClasssificationofMetamorphicRocks.

Cataclastic Metamorphism and its Products.Retrograde Metamorphism.ThermalMetamorphismofPeliticSediments,PureandImpureCalcareousrocks.AbriefstudyofFlaser,Mylonite,Hornfels,Marble,Ophicalcite.

### UNIT-V

Dynamo Thermal Metamorphism of Pelitic Sediments.Plutonic Metamorphism.Petrography and Origin of Charnockites – Metamorphic Differentiation –PneumatolyticInjection Metamorphism – Anataxis and Palingenesis.Brief study of Slate, Phyllite,Quartzite, Schist.Gneiss, Granulite, Leptynite, Charnockite, Eclogite, Amphibolite,Schorl,Adinole,Lit-Par-Lit–gneissandMigmatite.

### TEXTANDREFERENCEBOOKS

1. Tyrrel,G.W-Principlesofpetrology,AsiaPublishingHouse.
2. Huang,W.T.-Petrology,MCGrawHill
3. Pettijhon,F.J.-SedimentaryRocks,Harper&Bros.
4. Harker,A.-PetrologyforStudents,Cambridge,
5. Turner.F.J.&Verhogen.J.-IgneousandMetamorphicPetrology,McGrawHill.
6. Williams,H,Turner,F.j.&Gillibert,C.M.-Petrography,Freeman.
7. Winkler,A.G.F.-PetrogenesisofMetamorphicRocks,McGrawHill.

### B.SC. APPLIED GEOLOGYSEMESTER-VI

**COREIX-ECONOMICGEOLOGY21UGY09**

### COURSEOBJECTIVES:

1. Tostudymineraldepositsandprocessesofformationofdepositsandthe natureofdifferentmineraldeposits,itsgenesisanddistributionofmajororeminerals.
2. Tounderstandthegeneticcontrolsofphysicalandchemicalprocessesoforeformationin variousgeologicalsettings.
3. Toprovidetheknowledgeongeologicalprocessesresponsibleformineralandoreformation,weatheringandothersecondarymineralizationprocesses.
4. To familiarizemode of occurrence of economicminerals,metallic and non-metallicminerals.

### UNIT-I

**Economic Geology -**Definition and Scope.Concept of Ore minerals, Gangue minerals.Tenor, Grade and Ores.Classification of Mineral Deposits.Outline of Lindgren's andBateman's Classifications.Controls of Ore Localization – Structural Controls-Stratigraphic, Physical and Chemical – Brief study of Metallogenetic Epochs andProvinces–GeologicThermometers.

### UNIT-II

Magmatic processes. – Mode of formation – Early magmatic processes and Deposits,Disseminations. Segregations and Injections – Late magmatic processes and deposits –Residual liquid segregation and Injection – Immissible liquid segregation and Injection –Sublimation.ContactMetasomaticprocesses–Effects–Resultingmineraldeposits.

Hydrothermalprocesses–Principles–Factorsaffectingdeposition–Wallrockalteration

– Minerals Sequence-Cavity filling deposits, Fissure veins, Shear zone, Stock-work,Saddle reef, Ladder vein, Fold cracks, Breccia filling, Solution cavities, Ore space andVesicular filling – Replacement deposits, The process and Deposits – Criteria ofreplacement.

### UNIT-III

Sedimentary processes and Cycles – Principles involved in Sedimentation – Cycles ofIron and Manganese, WeatheringProcesses-Principles-ConcentrationProcess andDeposits – Mechanical Concentration Principles – Eluvial, Alluvial, Beachand Aeolianplacers.OxidationandSupergeneSulphideEnrichment–SolutionanddepositionintheZoneofOxidation–SecondarySulphideEnrichments– Gossans andCapping.

Metamorphic processes – Formation of Graphite, Asbestos,Talc, Soapstone andSillimanitegroupofminerals.

### UNIT-IV

**MineralResourcesof India**–Oremineralogy,Association,Genesis,Modesofoccurrence,originandIndianDistributionofthefollowingMetallicOreDeposits-Copper,Gold,Silver,Uranium,Thorium,Beryllium,Zirconium,Tin,LeadandZinc.

### UNIT-V

Mineralogy, mode of occurrences, uses and distribution in India of the followingMetalliferous deposits –Iron,Manganese,Molybdenum,Titanium,Aluminum,Chromium.Refectoryminerals,Industrialminerals,Abrassiveminerals,Ceramicmineraland Fertilize, Pigments minerals. Fossil fuels – Coal – Uses, Classification, Constitution,Origin and Distribution in India. Petroleum- Composition, Uses, Theories of Origin, OilTrapsandImportantOilfieldsofIndia.

**Mineral Economics:** Concepts-Strategic-Critical and Essential Minerals- Demand andsupply – Mineral Conservation and substitution. Outline of National Mineral Policy(NMP)andMineralConcession Rules.(MCR).

### TEXTANDREFERENCEBOOKS

1. BatemanAllan(1962),M.EconomicMineralDeposits,AsianPublishingHouse,2ndEdition
2. Lindgren,W.(1993),MineralDeposits,McGrawHill.
3. Coggin,B.andDey,A.K.(1955),India'sMineralWealth.
4. Park,C.F.andMacdiarmid,R.A(1970),Oredeposits,Freeman.
5. Krishnaswamy,S.India'sMineralResources,OxfordandIBH.
6. Deb,S.(1980),IndustrialMineralsandRocksofIndia,Allied.
7. Gokhale,K.V.G.K.&Rao,T.C.(1978),OredepositsofIndia,theirdistributionandprocessing,Thosmson.

### B.Sc APPLIED GEOLOGYSEMESTER-VI

**COREX-PHOTOGEOLOGYANDREMOTESENSING21UGY10**

COURSEOBJECTIVE:

* 1. Tounderstandthe aerialphotographyandPreparationofPhoto-geologicMaps.Mosaiccontrollingfactorsofaerial photograph.
	2. ToknowaboutElectro-MagneticSpectrum,SpaceplatformsandElementaryideaabout activeandpassivesensors.
	3. Applicationofphoto-geologyandremotesensingingeologicalstudies.
	4. Toimpartknowledgeofenvironmentalgeology,naturalhazardsandbasicconceptsofremotesensingand GIS.

### PHOTOGEOLOGY

**UNIT-I**

DefinitionandScopeofRemoteSensinginGeology.ElectromagneticSpectrum–DefinitionandComponents.Energysourcesandradiation–OutlineofInteractionofElectromagneticSpectrumwithAtmosphereandEarthsurfacefeatures

–SpectralSignatures–AtmosphericWindows.

### UNIT-II

Types of Remote Sensing: Based on 1) Energy sources: Active and Passive. 2)Platforms:AerialandSatelliteand3)Sensors:Optical,Thermal,andMicrowaves.4)RADAR.AerialRemoteSensing-Typesof AerialPhotographs:VerticalandOblique.ScaleofAerialPhotographs–FlightProcedures.Stereoscopes:PocketandMirrorStereoscopes.

### UNIT-III

PhotoInterpretationElements.Mosaics:ControlledandUncontrolledMosaics

– Advantage and Disadvantages – Application of MosaicsinGeologyStudies.Satellite Remote Sensing: Principles of Optical Remote Sensing: Satellite OrbitingMechanisms – Brief account of Multi Spectral Scanning – Along track and Across trackscannings.TypesofResolution–DataAcquisitionandInterpretation.

### REMOTESENSING

**UNIT-IV**

Aerial Photography: Types of Aerial Photographs, Geometry of AerialPhotographs:Oblique, Vertical and Stereopair. Scale of Photograph: Determination of Scale-reliefdisplacement–Stereoscopes-Parallaxbar.

### UNIT-V

Thermal Remote Sensing: Thermal Radiation Principles – Atmospheric Windows –Advantages and Disadvantages. SLAR – Principle and Applications.A short account ofLANDSAT,SPOT,IndiaRemoteSensingSatellitesandIndianSpaceMissions.

### TEXTANDREFERENCEBOOKS

1. Curran,P.B.(1985),PrinciplesofRemoteSensing,ELBS,London.
2. Drury,S.D.(1993),ImageInterpretationinGeology,Allen&Unwin,London.
3. Miller,V.C.(1961),PhotogeologyMcGrawHill,NewYork.
4. Pandey,S.N.(1989),PrinciplesandApplicationsofPhotogeology,WileyEastern,Delhi.
5. Sabins,F.F.(1974),RemoteSensingPrinciplesandInterpretation,Freeman,NewYork.
6. Reddy,A.(2010),PrinciplesofRemoteSensingandGIS,CBS,Delhi.
7. Gupta,R.P.(2003),RemoteSensingGeology,Springer,NewDelhi.
8. Lillisand,T.M.&R.W.Kiefer(2000),RemoteSensingandImageInterpretation,Wiley.

### B.SC. APPLIED GEOLOGYSEMESTER-VI

**COREXI-MININGANDENGINEERINGGEOLOGY21UGY11**

### COURSEOBJECTIVES:

1. To understand the basic fundamental concepts of various mining methods, theirterminologies,andthetypeofsamplingadopted,explosivesusedinthemine,andtohaveabasicknowledgeabout minemachineries.
2. Toprovidetheknowledgeofgeologicalinvestigationforsiteselectionofengineeringprojects.
3. Tounderstandtherocktypeandtheirengineeringproperties,suitabilityofsiteconditionsforDam,tunnel,roadsandhighways.
4. Todevelopconceptandappliedaspectofgeologyinvariouscivilorgeoengineeringprojects.

### MININGGEOLOGY

**UNIT-I**

Sampling-Principles - Types- Collection of sample-Core Sample andtheirPreservation. Mining Terminology: Exploitation-Development-Shaft, Level, Adit,Hanging Wall, Foot wall, Drive, Cross-Cut, Tunnel, Raise, Winze and Chute**. Drilling:**Percussion-Rotary-Miscellaneous drilling methods-Geological Logging of Boreholesamples.**Methods of breaking rocks – Explosives:** Low, High, Sheathed,Permitted,Liquid Oxygenand Miscellaneous.

### UNIT-II

**Mining Methods:Opencast Mining-**Loading by Manual, Machines, Glory HoleandKaolineMining. **Underground Mining:**Stoping**-**Open stopes,Overhand: Timbered,Filled,Shrinkage,MitchellSlicing SystemandCavingMethods.

### UNIT-III

**Alluvial Mining –** Pan and Batea-Rocker-Longtom-Sluicing-Derrick andCableway-Hydraulicking-Drift and Dredging.**Coal Mining:** Pillar methods- Longwall advancing-Longwall retreating-Horizon mining and Miscellaneous: Underground hydraulic mining -Strip mining.

### ENGINEERINGGEOLOGY

**UNIT-IV**

**Introduction to Engineering Geology:** Scope, Engineering properties ofrocks, RockDiscontinuity.PhysicalcharactersofBuilding,DecorativestonesandConcreteaggregatesand Roadmaterials.

**Soils**-PhysicalandEngineeringProperties.SoilFormation,ProfileandClassification.Soilerosionand Itscontrol.AnaccountonSoil GroupofIndia..

**Dams**:Definition,Types,Geologicalconditions,SiteinvestigationsandDamfoundations.AshortnoteonimportantIndianDams.

**Reservoirs** - Definition, Selection of Reservoir sites and Groundwater conditions.ProblemsinReservoirs:Sedimentations,Slopecontrol,LeakageandSeismicity.ShortaccountofIndianand Tamilnadureservoirs.

### UNIT-V

**Tunnels**-Definition,PartsofaTunnel,Tunnelinginhardandsoftrocks,GeologicalinvestigationandGroundwaterconditions.

**Roads**-ComplicatedregionsforRoads,Geologicalproblemsafterroadconstruction.Improvementof Sites- Soilstabilization.

**Foundations**-Definition, Geological investigations and groundwater problems.**Landslides-**Definition,Slopestability,SlopefailureandSafety.SlopeControl,Geologicalfactors,GroundwaterconditionsandRemedialmeasures.

**MassMovements-**Causes,Types,MonitoringandControlsofmass movements.

**TEXTBOOKS**

1. R.N.P.Arogyasamy,CoursesinminingGeology,Oxford&IBHPublishingCo.
2. Mckinstry-MiningGeology.
3. K.K.Chatterjee-AnIntroductiontoMineralEconomics.
4. R.K.Sinha&N.L.Sharma-MineralEconomics.
5. ThomasR.T.(1979)–AnIntroductiontoMining–Methun.
6. REFERENCEBOOKS
7. Bell,F.G. (2005),Fundamentalsof EngineeringGeology,B.S. PublicationsHyderabad.
8. Krynine,P.D.&W.R.Judd(1956),PrinciplesofEngineeringGeology&Geotechnics,CBS, Delhi.
9. Legget,R.F.&A.W.Hatheway(1988),GeologyandEngineering.3rdEd.McGrawHill,NewYork.

### B.SC. APPLIED GEOLOGYSEMESTER-VI

**COREXII-HYDROGEOLOGYANDENVIRONMENTALGEOLOGY21UGY12**

### COURSEOBJECTIVE:

1. Toimpartknowledgeofbasichydrogeologyincludinggroundwaterorigin,occurrenceanddistribution.
2. Totrainstudentsonbasicsofwellhydraulics,methodofexploration,waterbudgetandmanagement.
3. Toimparttheoretical,practicalandfieldknowledgepertainingtoHydrogeologicaldomain.
4. Tounderstandtherelationshipinbetweenwaterandrockinteractionandsaltwaterintrusionanditsremedialmeasuresinthecoastalaquifers.

### HYDROGEOLOGY

**UNIT-I**

Definition of Hydrology and Hydrogeology – Hydrological cycle -Origin ofGroundwater- Water bearing formations: Aquifers, Aquiclude, Aquifuge and Aquitards.Types of Aquifers: Unconfined, Semi-confined, Confined and Perched – Verticaldistributionofgroundwater–**Springs**:Types,Geologicalconditionsfavoring

developmentofsprings.ArtesianwellsandPiezometricsurface.Rockpropertiesaffectinggroundwater.TypesofOpenings, Porosity,Specificyield,SpecificretentionandPermeability.Determination ofpermeabilityin field and lab.

Groundwatermovement–Darcy'slawanditsapplications–GroundwateroccurrenceinIgneous,SedimentaryandMetamorphic rocks.

### UNIT-II

Groundwater investigation-Electrical Resistivity Methods: Wenner’s and Schlumberger'selectrodearrangements.**Wells:**OutlineofDugwells,Tubewells,Jettedwells,InfiltrationgalleriesandCollectorwells–Welldesignanddevelopment–Fluctuationsofgroundwater

– Groundwater recharge methods. Suitability for drinking and irrigation purposes –Seawaterintrusion:Causes,ConsequencesandPreventiveandControlmeasures.

### UNIT-III

**Groundwater Quality:** Analysis of pH-TDS-TSS-Specific Conductance- Hardness-Mineral characteristics-Expression of Analysis: Cations, Anions.Groundwater resourcesof Tamilnadu including its quality. The latest drinking and irrigation water standards ofWHO and BIS – Waterborne diseases. Groundwater Recharge:- Recharge Methods -Basin method, Stream channel method, Ditch or Furrow method, Flooding method,Irrigationmethod,PitmethodandRechargewellmethod.RainwaterHarvestingSystems.

### ENVIRONMENTALGEOLOGY

**UNIT-IV**

IntroductiontoEnvironmentalSciences-AbriefaccountofEnergySystem.

Classification of Natural Resources -Renewable and Non-Renewable resources.**Water Resources:** Surface and Groundwater-Uses and Exploitation. Flood, Drought,Dams,BenefitsandProblems.

**Mineral Resources:** Resource and Exploitation, Effects of Extraction on Environment.**Land Resources:** Land as a resource, Land degradation, Man induced landslides, Soilerosion and Desertification. Role of Individual in Conservation Natural Resources,Equitable use ofresourcesforsustainablelifestyle.

### UNIT-V

**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem.Forest,Grassland, Desert, Aquatic Ecosystem. Cause, effects and control measures of Waterpollution, Air pollution and Mine pollution- Marine pollution- Noise pollution.Cause,Effects and Control measures of Thermal pollution- Nuclear hazards- Solid andRadioactivewastemanagement.Roleofindividualinpreventionofpollution.DisasterManagement: Floods,Earthquakes,LandslidesandSoilerosion.

### TEXTBOOKS

1. Todd,D.K.andL.W.Mays(2004),GroundwaterHydrology,JohnWiley&Sons.
2. Davis,S.N.&Deweist.,R.J.M.(1966),Hydrogeology,JohnWiley&Sons,NewYork
3. Ragunath,H.M.(2007),Groundwater,NewAgeInternationalPublishers,Delhi
4. Karanath,K.R.(1987),GroundwaterAssessment,Development&Management,TataMcGrawHill.
5. Ramakrishnan,S.(1998),Groundwater,K.G.GraphArts,Chennai.
6. REFERENCESBOOKS
7. Valdiya, K.S (1987), Environmental Geology – Indian Context. Tata McGraw-Hill.,Delhi.
8. Kellar,E.A.(1979),EnvironmentalGeology,Charles.MerrillPublishingCo.ohio.
9. Lundgren,I.(1986),EnvironmentalGeology,PrenticeHall.

### B.Sc. APPLIED GEOLOGYSEMESTER-VI

**COREPRACTICAL-IIICRYSTALLOGRAPHYANDMINERALOGY21UGYP03**

### CRYSTALLOGRAPHY

**DescriptionofformspresentanddeterminationofMillerindicesofthefollowing:**

CRYSTALMODELS:

**IsometricSystem:**NormalClass–Galena,Fluorite,Magnetite,Garnet,andLeucite,Copper-Pyritohedralclass–Pyrite, TetrahedralClass–Tetrahedrite.

**TetragonalSystem**:NormalClass–Zircon,Vesuvianite,Cassiterite,andRutile.Tripyramidal–Scheelite,MeioniteSphenoidalClass –Chalcopyrite.

**Hexagonal System**: Normal Class – Beryl, Tripyramidal – Apatite, Hemimorphic –Zincite,RhombohedralNormal –Calcite,TrapezohedralClass–Quartz.

**OrthorhombicSystem**:Normal–Barite,Sulphur,Stibnite,Topaz,Staurolite,andAragonite.Hemimorphic–Calymene,SphenoidalClass –Epsomite.

**MonoclinicSystem**:Normal–Gypsum,PyroxenesandAmphiboles.

**TriclinicSystem**:Normal–Axinite,Albite,andRhodonite.

**TwinCrystals**:ContactandPenetrationtwinsofFluorite,IronCrossTwinofPyrite,Kneetype twin of Cassiterite, Polysynthetic twin of Aragonite, Cyclic twin of Cerussite,SwallowTailofGypsum,TwinsofCarlsbad,Baveno,Manebach,AlbitelawofAlbite.

### MINERALOGY

Megascopicidentificationanddescriptionofthefollowing:

**Quartz Group**: Quartz, Chalcedony, Opal, Agate, Flint, Jasper, Amethyst, Rosequartz,Chert.

**Feldspar Group**: Orthoclase, Microcline, Albite, Oligoclase, Labradorite.**FeldspathoidGroup**:Adularia,Sanidine,Nepheline,Sodalite,llapislazul.**PyroxeneGroup:**Enstatite,Bronzite,Hypersthene,Augite.

**AmphiboleGroup**:Hornblende,Actinolite,Tremolite.

**OlivineGroup:**Olivine,Serpentine.

**MicaGroup**:Muscovite,Biotite,Phlogopite,Lepidolite,Vermiculite.

**Other Minerals**: Chlorite, Epidote, Garnet, Apophyllite, Stilbite, Heulandite, Talc,Steatite,Beryl,Kaolin,Cordierite,Apatite,Andalusite,Staurolite,Sillimanite,kyanite,Tourmaline,Topaz,Calcite,DolomiteFluorspar.

### OpticalMineralogy:

Microscopicidentificationanddescription ofthe following: Quartz,Orthoclase, Albite,Oligoclase, Andesine, Labradorite, Anorthite, Nepheline, leucite, Sodalite,Hypersthene,Augite, Diopside, Aegirine, Hornblende, Tremolite, Actinolite, Glaucophane, Riebeckite,Muscovite, Biotite, Phlogopite, Olivine, Serpentine, Chlorite, Epidote, Garnet, Apatite,Zircon, Sphene, Magnetite,Tourmaline, Calcite, Dolomite, Andalusite, Staurolite,Sillimaniteand Cordierite

### Geochemistry:

Identificationofthefollowingmineralpowdersbysimpleblowpipetests:Apatite,Barite,Calcite,Celestite,Cerusite,Chalcopyrite,Galena,Gypsum,Chromite,Haematite,Magnesite, Magnetite, Psilomelane, Pyrolusite, Siderite, Sphalerite, Strontianite,Witherite,Stibnite,IlmeniteandWolframite.

### B.Sc. APPLIED GEOLOGYSEMESTER-VI

**COREPRACTICALPAPER–IVECONOMICGEOLOGYANDPETROLOGY21UGYP04**

### ECONOMICGEOLOGY

**IndustrialMinerals:**

### Megascopicidentificationanddescription,Indianoccurrencesandusesofthefollowing:

Magnesite,Gypsum,Asbestos,Fluorite,Calcite,Graphite,Barite,Talc,Witherite,Strontianite, Anhydrite, Bauxite, Halite, Dolomite, Aragonite, Kaolin, Garnet,Corundum,PhosphateNodule**,** Coalanditsvarieties.

**FeOres:**Magnetite,Hematite,Limonite,Pyrite,MarcasiteandSiderite.

**CuOres:**Chalcopyrite,Cuprite,Bornite,Malachite,Azurite,NativeCopper.

**MnOres:**Pyrolusite,Psilomelane,Rhodochrosite,andRhodonite.

**PbOres:**Galena,Cerussite,Anglesite.

**ZnOres:**Smithsonite,Sphalerite.

**SnOre:**Cassiterite.

**AsandSbOres:**Realgar,Orpiment,Stibnite.

**MiscellaneousOres:**Wolframite,Molybdenite,Bauxite,Chromite,Ilmenite,Rutile,Cinnabar.

**RadioactiveOres:**Monazite,Zircon,Pitchblende,andPyrochlore.

### PETROLOGY

Megascopicidentificationofthefollowingrocks:

### IGNEOUSROCKS:

Granite, Graphic granite, Pegmatite, Aplite, Schorl Rock, Granite Porphyry, Syenite,Syeniteporphyry,Diorite,Gabbro,Anorthosite,Dunite,Pyroxenite,Dolerite,DoleritePorphyry,Basalt,Trachyte,Rhyolite,Obsidian,Pumice,Scoria.

### SEDIMENTARYROCKS:

Conglomerate,Breccia,Sandstone,Arkose,Shale,ShellyLimestone,Laterite,Peat,Lignite.

### METAMORPHICROCKS:

Slate,Phyllite,Schists,Gneisses,Quartzite,Marble,Amphibolite,Ecologite,Leptynite,Charnockite,Khondalite,andBasicGranulite.

Microscopicidentificationanddescriptionofthefollowingrocks:

### IGNEOUSROCKS:

Mica Granite, Hornblende Granite, Tourmaline Granite, Schorl Rock, Aplite,GraphicGranite, Mica Syenite, Hornblende Syenite, Nepheline Syenite, Diorite, Gabbro, Norite,Dunite, Peridotite, Granite – porphyry. Syenite – Porphyry, Diorite – Porphyry, Dolerite,Minette, Vogasite, Anorthosite, Trachyte, Andesite, Basalt, Phonolite, Volcanic Breccia,Vitrophyre.

### SEDIMENTARYROCKS:

Conglomerate,Breccia,Sandstone,Arkose,Shale,ShellyLimestone.

### METAMORPHICROCKS:

Slate,ChloriteSchist,MicaSchist,KyaniteSchist,StauroliteSchist,GarnetiferousSchist,Glaucophane Schist, Granulite, Charnockite, Ecologite Amphibolite, Leptynite,Khondalite,Cordierite,Gneiss,Garnet–SillimaniteGneiss,CalcGranulite.

### B.SC.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERIMAPPINGTECHNIQUESINGEOLOGY**

### 21UGYS01

**COURSEOBJECTIVE:**

1. Toimpartknowledgeofgeologicalfieldsurvey.
2. Totrainthestudentstounderstandfunctioningofnecessaryinstrumentsrequiredduringgeological field survey.

### UNIT-I

Definition and Scope of Mapping inGeology.GeologicFieldNotes:FieldEquipments:ClinometerandBruntonCompass-GeologicalHammer-Pocketlens–Streakplate–Handmagnet–Measuringtape.

### UNIT-II

FieldObservations–MeasuringAttitudesofStructuralfeatures:DipandStrikeofbeds-Fold-Fault-Unconformity-Foliation–Lineation–Joints.

### UNIT-III

Topographic Maps: Definition of Topography- Parts of Topographic map – Featuresrepresented, Map Enlargement, Reduction and Preparation of Base map – Height /elevationdatumintopographicmaps.

### UNIT-IV

Introduction to Scale in Topographic Maps – Aerial Photographs. Global PositioningSystem(GPS)-EstimatinglocationandRelativeHeight.PreparationofGeologicalMapsanditsInterpretation.

### UNIT-V

SamplingandCollection–Minerals,rocks,fossils.GeologicalReport–CrossSection–orderofsuperposition.

### REFERENCEBOOKS

1. Compton,R.R.(1962),ManualofFieldGeology,Wiley,NewYork
2. Mathur,S.M.(2001),GuidestoFieldGeology,PrenticeHallofIndia,Delhi.3.Freeman,
3. T.(1999),ProceduresinFieldgeology,BlackwellscienceOxford,U.K.4.Dutro,T.J.(1989),AGIdatasheet,AmericanGeologicalinstitute,AlexandriaVirginiaU.S.
4. Lahee,F.H.(1961),FieldGeology,CBS,Delhi.
5. Davis,G.H.(1985),StructuralGeologyofrocksandregions,Wiley,NewYork.
6. McClay,(1995),MappingofGeologicalStructures,GeologicalSoc.PublicationHouseBarth,U.K.

### B.SC.APPLIEDGEOLOGY

**LIST OF SKILL BASED ELECTIVE COURSE PAPER IIGEMMOLOGYANDGEMSTONEEVALUATION21UGYS02**

### COURSEOBJECTIVES:

1. Tolearnandtoexaminethenature,quality,rarityofgemstones.Tounderstandthephysicalandopticalpropertiesofgemstones.
2. Tosummarizetheorigin,classificationofgems.
3. Togiveanideaaboutthegemtestinginstruments.
4. Togainknowledgeandtoprovideskillstobecomeasuccessfulgemologist.

### UNIT-I

DefinitionandScopeofGemmology–MineralsasGemstones–ClassificationofGemstones–CharacteristicandDesirableFeaturesofGemstones.BasicPhysicalandOpticalproperties ofGemstones–OpticalClassificationofGemstones.

### UNIT-II

Gem Testing: Introduction to Gem Mineral Equipment and Instruments: Polarizer –Refractometer–Pycnometer–UseofHeavyliquids.Non-destructivemethodsingemIdentification.GemSimulantsandProxies.ArtificialGemstonesandSubstitutes.

### UNIT-III

GemstoneCutting:CuttingInstruments:DiamondSaw–Blade.PreliminaryObservations

– Rough Cutting of Gemstones – Sizing and Shaping of Raw stones – Styles of Cutting:Rounding,Cabochon,Flat,Square,Rectangle,Crown,Brilliant,andLaserSculpting.

### UNIT-IV

Weight Standard Schemes used in Gemology – 4Cs Scheme for Diamonds. Polishing ofGemstones – Polishing Angles and limits.Polishing Equipments.Feasibility andEconomics of Gem Industries in India with special reference to TamilNadu.Grading,Valuationand PricingofGems.

### UNIT-V

Gemstone Prospecting: Host rocks – Gemstone Mineralization – Deposits. ExplorationTechniquesandExploitation.GemstoneOccurrencesinIndiaandwithspecialreferencestoTamilNadu.

### REFERANCEANDTEXTBOOKS

1. Karanth, K.V. (2000), Gem and gem industry in India, Memoir 45, GeologicalSocietyofIndia,Bangalore.
2. Anderson, B.W. (1990), Gem testing (10th edition), Butterworth Scientific,London.Babu,T.M.(1998),DiamondsinIndia,GeologicalSocietyofIndia,Bangalore.
3. Hall,C.(1994),Gemstone,DorlingKindesley,London,Deer,W.A.,Houre,R.,

Aabdzussman,S.(1992),Anintroductiontorockformingminerals,ELBS,London.

1. Kerr,P.F.(1997),Opticalmineralogy,4thEd.McGrawHillBook&CoNewYork.

### B.Sc.APPLIEDGEOLOGY

**LIST OF SKILL BASED ELECTIVE COURSESFIELDHYDROGEOLOGYANDTECHNIQUES21UGYS03**

### COURSEOBJECTIVE:

* 1. Toimpartknowledgeof basicfieldhydrogeologyincludinggroundwaterorigin,occurrenceanddistribution.
	2. Totrainstudents onbasicsofCalculationofPorosityand Permeability, PumpTestdata, CalculationofGroundwaterFluctuations.

### UNIT-I

**Importance of Hydrology** – Difference between Hydrogeology and Hydrology, WaterBearingGeologicformations.GroundwaterProvincesofTamilNadu.CollectionofRainfalldata.Short accountonThiessenPolygonIsohyetalmaps.

### UNIT-II

**Hydrogeologic Parameters:** Calculation of Porosity and Permeability, PumpTest data,CalculationofGroundwaterFluctuations.

### UNIT-III

Wells–WellInventorySurvey:Waterlevel,WaterlevelFluctuation,SubsurfaceLayers(Soil thickness, Weathered zone, Fractured zone, Bed rock) - Wellconstruction - Welllogging -Sedimentaryaquifers:Sandstone,limestone.

### UNIT-IV

**Hardrock Aquifers:** Charnockites, Gneiss, Granite formation - Field observation andMeasurementofSoilmoisturezone, ZoneofAeration, Zoneofsaturation.

### UNIT-V

**Pumping Test:** Yield, Drawdown, Recuperation, Transmissivity,Permeability. Casestudies:RainfallinSalemdistrict,GroundwaterconditioninSalemdistrict.RainWaterHarvesting.

### TEXTBOOKS

ATextbook ofGroundwater–2000–P.Arul,DhanamAgency,99D,BazaarStreet,Virudachalam–606001.

GroundwaterHydrology–1959–DavidK.Todd–JohnWilley&Sons,NewYork.Ragunath,H.M.1987,Groundwater,WileyEasternLtd.,NewDelhi.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERIVWATERQUALITYANALYSIS**

### 21UGYS04

**COURSEOBJECTIVES:**

1. Toimpartknowledgeofbasicwaterqualityanalysis.
2. Totrainstudentsonbasicsoflaboratorymethodsusingqualityofwater.
3. StudyaboutRecyclingofwater,Waterbornediseases,ReverseOsmosis(RO)SystemandDesalinationof water.

### UNIT-I

PhysicalPropertiesofWater:Color,Odor,Taste,Temperature,TurbidityandViscosity.Methods of Analysis of Physical Properties.WorldHealth Organization (WHO) andBureauofIndianStandards(BIS).

### UNIT-II

ChemicalPropertiesofWater:pH-Alkalinity,AcidityandtheirMeasurements,IonizationPotential, Gas solubility, Precipitation and Dissolution of Ions, EquivalentWeight and itsmeasurement,ColloidsandCoagulation,InsolubleComponentsandtheirMeasurements.

### UNIT-III

Laboratory Methods of Analysis: Standard Solutions – Determination of pH– Hardness –Dissolved Oxygen – BOD – COD, TDS-TSS. Determination of F, Cl, N,P, K, Na Ca, Mg,Fe,CaCO3,HCO3&Tracemetals.

### UNIT-IV

Utility of Standards required for Potable, Agricultural and IndustrialPurposes. Tools usedforassessingthequalityofwater.

### UNIT-V

Water Pollution: Urban, Industrial pollution and Remedial measures.Arsenic andFluorideContentinwater.Recyclingofwater,Waterbornediseases,ReverseOsmosis(RO)SystemandDesalinationofwater.

### REFERENCEBOOKS

1. Davis,N.S.,Dewiest,R.J.M.(1996),Hydrogeology,JohnWiley,NewYork.
2. Todd,D.K.,(2002),Groundwater3rdedition,JohnWiley,Singapore.
3. Freeze,R.A.,Cherry,J.A.(1979),GroundWater,PrenticeHall,NewJersey.
4. Sawyer, C.N., McCarty, P.L. (1878), Chemistry for Sanitary Engineers, 3rdedition,McGrawHill,NewYork.
5. APHA,(1980),StandardMethodsfortheExaminationofWaterandWasteWater,15thedition, American Water Works Association and Water Pollution ControlFederation,NewYork.

### B.Sc.APPLIEDGEOLOGY

**LIST OF SKILL BASED ELECTIVE COURSES PAPER VGRANITE EXPLORATION AND EXPLOITATION21UGYS05**

### COURSEOBJECTIVES:

1. Theobjectiveofthiscourseistogivehands onexperienceforthestudentsinidentifyingtypes,miningmethodsofgranite,explorationandmarketing.

### UNIT-I

Definition of Granite.Magma types- Granitic magma, Building Stones.Basicproperties ofBuildingand Dimensionalstones.EngineeringpropertiesofGranite.

### UNIT-II

TypesofGranitesandtheirCommercialTerminologies.GraniterockExploration.MiningMethodsofGranites -Markingmethods.MethodsofCuttingandPolishingofGranites.

### UNIT-III

MethodsofExploration:GeologicalandGeophysicalmethods.Importantrocks ofGraniteIndustries–GranitesandMarbles.

### UNIT-IV

Machineries used in Granite Industries – Wire Saw Machine, Cutting andPolishingMachines.

### UNIT-V

Marketing,PricingandExportofGranites.GranitesandGraniteIndustriesofIndiaandTamil Nadu.EndusesofGranitewastes.Manufacture Sand.

### REFERENCEBOOKS

1. CoursesinMininggeology–RPNArogyasamy-JohnWileyEasternPub
2. Economicminerals–U.Prasad-CBS
3. AnintroductiontoMineralEconomics-KKChattejee -JohnWileyEasternPub
4. MineralEconomics-RKSinha&NLSharma-Oxford &IBH
5. FieldGeology-Mathur.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERVIGEOSTATISTICS AND COMPUTER APPLICATIONS21UGYS06**

### COURSEOBJECTIVE:

1. To understand the description of statistical parameters employed to analyse.2.Tosynthesizegeologicaldataforaccurateandauthenticinterpretation.

### GEOSTATISTICS

**UNIT-I**

GeoscienceSystemsandStatistics:NumericaldatainGeoscience.Frequencydistribution:Mean Median, Mode, Dispersion and Measures of Central Tendency: Merits andDemerits. Measures of Dispersion: Skewness and Kurtosis, Addition, Multiplication andDivision.

### UNIT-II

Sampling and Sampling plan in Geoscience: Theoretical basis and sampling: SampleRandomSamplingSystematicandStratifiedandClustersampling:StandardErrors.NullHypothesis.CorrelationandRegression AnalysisinGeoscience.

### COMPUTERAPPLICATIONS

**UNIT-III**

Introduction to Computer – Elements of Computer: Hardware and Software. Hardware:Inputdevices:Keyboard,Mouse –Outputdevices:Monitor,Printer–Memory–Primary:

-RA,RAMandSecondaryMemory:Hard Disk,Floppy&CD.

### UNIT-IV

A short account on: Algorithm – Flowcharts, Programming languages – OperatingSystems – DOS – Windows – DBMS. Computer applications in Geology:Flowcharts forsimpleProgrammes–GeologicalaspectsinWindows.

### UNIT-V

Introduction to GIS Software in GIS, Utility of computer Software in Geological studies –Bardiagram, Piediagram,Rolediagrams,Scatterdiagram,X-Yplots.

### TEXTBOOKS

1. Balagurusamy,IntroductiontoComputers.
2. SarojK.Pal(1985)–StatisticsforGeoscientists:Techniquesandapplications,conceptpublishingCo.,NewDelhi.
3. C.Davis(1975),StatisticsanddataanalysisinGeology,JohnWiley&Sons.
4. Gupta,G.V.(1995),BasicStatistics,Chand.
5. Ravichandran, D. (2001), Introduction to Computers and communication, TataMcGrawHillPublicationLtd.,
6. REFERENCEBOOKS
7. D.F. Merriam (1989), Edited Statistical Analysis: A Computer Oriented Approach,Computer Application in the Earth Sciences, A.A. Affi. An International SymposiumPienumPress,NewYork.
8. RobertL.Miller(1982),StatisticalanalysisintheGeologicalSciences,JohnWileyandSons,NewYork.
9. Palk, S.K. (1998), Statistics for Geoscientist Techniques and Applications.10.Gregory,S.(1963),StatisticalMethodsandthegeographerLongman&London.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERVIIREMOTESENSING AND GIS**

### 21UGYS07

**COURSEOBJECTIVE:**

ToimpartknowledgeandapplicationsofremotesensingandGISinGeology.2.To learnbasicofaerialremotesensingand itsapplications.

Tounderstandthephysicsofelectromagneticspectrumandlearn satelliteremotesensing.To havetraininginGIScomponents,models and applications

### REMOTESENSING

**UNIT-I**

Definition and Types: Aerial, Satellite and Radar, Development of Space Programmes -History and Organization Associated with Remote Sensing in India and in otherCountries.

### UNIT-II

Remote Sensing: Sources of Energy, Electromagnetic Radiations (EMR) AtmosphericWindows,EnergyInteractionwithAtmosphereandEarth.TypesofPlatforms:ActiveandPassive.RemoteSensingMethods, IdealRemoteSensingSystems.

### UNIT-III

Fundamentals of Aerial Remote Sensing: Components of Aerial Camera,Types of AerialPhotographs, Marginal Information of Aerial Photographs, Elements of PhotoInterpretation.

### GIS

**UNIT-IV**

Fundamentals of Satellite Remote Sensing: Types of Satellites: Geo-Stationaryand Sun-SynchronousSatellites,Resolution:Spatial,Spectral,RadiometricandTemporal,TypesofData Products,MarginalInformationofSatelliteImages.

### UNIT-V

Geographical Information Systems (GIS) Meaning- Developments-Raster andVectorData-DataIntegration-GlobalPositioningSystem(GPS)AdvantagesandLimitationsofGISand GPS.

### REFERENCEBOOKS

1. Barret,E.C.andCurtie,L.F.(1990),IntroductiontoEnvironmentalRemoteSensing,ChapmanandHall,London.
2. Cambell, JamesB. (1987), Introduction to RemoteSensing,The GuilfordPress, NewYork.
3. Lillesand, T. M. and Kieper (1987), Remote Sensing and Image Interpretation, JohnWillyand Sons,NewYork.
4. Lueder, D.R. (1959), Aerial Photographic Interpretation, McGraw Hill Book, ce.,NewYork.
5. Wolf,P.R.(1974),ElementsofPhotogrammetry,McGrawHill,NewYork.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERVIIIMINES AND MINERALS LEGISLATION OF INDIA21UGYS08**

### COURSEOBJECTIVES:

1. Thecourseaimtoprovideanoverviewofthelegalandpolicyframeworkontheminingsector inIndia.
2. Tounderstandtheprocedureforobtainingmineralconcessionofregulationanddevelopment.

### UNIT-I

IntroductiontoMineralEconomics;Essential,CriticalandStrategiesminerals-DemandandSupply-NationalMineralPolicy–ProblemsandProspects–IndustrialpolicyResolutions,1956–Schedule–A,Schedule–B,Energypolicy,Forestpolicy.

### UNIT-II

Essential - Strategic and Critical minerals – Minor minerals – Major minerals.Evolutionof National Mineral policy – Ideal Scope of a Mineral Policy – Categoriesof Minerals forGrantofConcessions.

### UNIT-III

Procedure for Obtaining Mineral Concession – Termination, Surrender and Determinationof Mining Lease – The Oil fields (Regulation &Development) Act, 1948 – The Mines&Minerals(Regulation&Development)Act,1957.

### UNIT-IV

MineralConcessionRules,1960–TheMiningleases(Modificationofterms)Rules,1956

–MineralsConservationandDevelopmentRules,1958.TheCoalminesAct,1974-CoalminesRegulation, 1957.

### UNIT-V

The Atomic Energy Act, 1957 – The Atomic Energy Act, 1962 – The Mines Act, 1952 –Mines Rules, 1955 –– Metalliferous Mines Regulation, 1961 – Mineral Taxation andIncentive measures – Incidence of Taxes – Depletion Allowance – Simplification ofTaxationlaws.

### REFERENCEBOOKS

1. AnIntroductiontoMineralEconomics–K.K.Chatterjee.
2. MineralEconomics-R.K.Sinha&N.L.Sharma.
3. IndustrialMineralsandRocksofIndia(1980)–S.Deb,AlliedPublishers.

### B.Sc.APPLIEDGEOLOGY

**LIST OF SKILL BASED ELECTIVE COURSES PAPER IXINTRODUCTION TO GEOINSTRUMENTATION21UGYS09**

### COURSEOBJECTIVE:

1. Totrainthestudentstounderstandfunctioningofnecessaryinstrumentsrequiredduringgeological field survey.
2. ToimpartknowledgeandapplicationsoffieldphotographictechniquesandGISinGeology.
3. Totrainthestudentsdescriptionhandlingandapplicationofthefollowingequipments.

### UNIT-I

BasicEquipments:Description,HandlingandApplicationsofthefollowingequipments:Hammers,Chisels,Handlenses,Clinometer,BruntonCompass,Jacob'sstaff,Pedometer.

### UNIT-II

SurveyEquipments:Chainsurvey,PlaneTable,PrismaticCompass,Theodolite,GPS.FieldPhotographicTechniques,SpotAnalysisKitforwaterandSoiltest.

### UNIT-III

Geophysical Survey Equipment: Gravimeters, Magnetometers, Resistivity SurveyEquipments,SeismicSurveyEquipments,Scintillationcounter,WellloggingInstruments.

### UNIT-IV

PocketStereoscope,MirrorStereoscope,Stereometer,Pantograph,Rotometer,PlottingEquipments. Petrological Microscope, Ore Microscope, Photomicrograph Equipment,Stereomicroscope.

### UNIT-V

GeochemicalEquipment:pH&Ehmeters,Potentiometers,TDSdetermination,ChromatographicTechniques,AASpectrometer,ICP–MS,XRF–XRD.

### REFERENCEBOOKS

1. FieldGeology-S.M.Mathur
2. FieldGeology-Gokhale
3. FieldGeology-F.Lahee4
4. FieldGeology-R.Compton
5. Surveying-Punmia
6. Geophysics-Telford
7. Geophysics–RamachandraRao
8. Mineralogy-Dennan
9. TextBookofSurveying-S.K.HusainandM.S.Nagaraj.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERXCARTOGRAPHY**

### 21UGYS10

**COURSEOBJECTIVE:**

1. Tounderstandthevariouspurposes,rolesandrepresentationofcartography.Togainandpracticelanguage inthecreative designprocess.
2. Togainandpracticeskillsincartographicdesign,representationandproducedinaGISenvironment.
3. Tobeabletocreatedigitalmapsinformatsreflectingthepurpose,contentandfunctionofinputdata.

### UNIT-I

Cartography - Nature, Scope and Content of Cartography -Arts and Science ofCartography-Cartographyasasystemofcommunication-Maps-Classificationandtheiruses-Growth,Developmentand Modemtrendsincartography.

### UNIT-II

Map Drawing and Measuring Techniques - Map Setting – The Earth and System of Co-ordinates-BaseMap-CompilationandGeneralizationofMaps.

### UNIT-III

Symbolization: Types of Cartographic Symbols - Point, Line, and Area symbols -QualitativeandQuantitativeDataGeneralization.

### UNIT-IV

MapDesignandLayout:GeneralDesignProblems -PrinciplesofCartographicdesignandDesign of Map Symbols - Lettering – Lettering Methods, Positioning of letters -Geographicalnames.

### UNIT-V

MapReproduction-ProcessofMapProduction–PhotographicSystems-Multiple

ReproductionProcesses-ComputerApplicationinCartography-ComputerMapping-Remote Sensing and Cartography - Uses of Air photographs and Satelliteimages inCartography.

### REFERENCEBOOKS

1. Misra,R.P.andA.P.Ramesh-FundamentalsofCartography
2. Robinson-ElementsofCartography
3. Keats,J.S-CartographicDesignandProduction.
4. Raiz-Principles ofCartography.

### B.Sc.APPLIEDGEOLOGY

**LISTOFSKILLBASEDELECTIVECOURSESPAPERXIGEOLOGY FOR COMPETITIVE EXAMINATIONS21UGYS11**

### COURSEOBJECTIVE:

1.Toimpartknowledgeofobjectivegeologyforvariouscompetitiveexamination,knowaboutvariousquestionpaper patterninformation.

### UNIT-I

Types of Competitive examinations: State and Central Competitive examinations –TNPSC,UPSC(CivilServices,GSI,IFS),UGC-CSIR,ONGC,AMD,CoalIndiaLtdetc.

### UNIT-II

Awarenessofsyllabusprescribedforvariouscompetitiveexaminations.Objectiveanddescriptive type of questions.Preparation strategies - Collection of previous questionpapers-Internet andlibrarysearchforinformation.

### UNIT-III

Scope and limits of Objective type examinations - Pattern and Style of Objective typeQuestions - Level of difficulty and Standard Expected - Long Term study and Planning.Preparationstrategiesforshort answerandshort essaytypeexamination.

### UNIT-IV

Study methods - Objective type - Short essay type. Examination techniques: - Pre- Exampreparation - Writing / Choosing Questions from Simple to Complex (or)vem known topartlyknownbeforeAnswering/writingAnswers–TimeConcept andExaminationEthics.

### UNIT-V

Interview-BasicEnglish,MathematicalAbility,LogicalReasoningandMentalAptitude

-GroupDiscussion,TechnicalInterviewandManagementRound.DressCodeandPhysicalFitness.

### REFERENCESBOOKS

1. Julka and Ravi Misra (2003), Geo informa – for the cause of promotingGeoscience,TechnologyPublications,Dehradun.
2. Maddox,H.(1985),Howtostudy,Rupapublications,Delhi
3. Barrass,R.C.2001,Study,Routledgestudyquides,chapman&Hall,4.Srivastava
4. A.P.(1994),Scoringhighinexaminations,heartinglaboratorypublications,Delhi.
5. BarlesRob,(1992),Successfulstudyfordegrees,Routledge,London.
6. Sayeed,A.(2002),TrendsinobjectiveGeology,CBS,Delhi
7. Jhulka,A.(1992),ObjectiveGeology,CBCS,Delhi,
8. Bopche,A.(1999),ObjectiveGeology,DhanpatRai,Delhi.

### B.Sc.APPLIEDGEOLOGY

**LIST OF SKILL BASED ELECTIVE COURSES PAPER XIIPRINCIPLESOFSURVEYING**

### 21UGYS12

**COURSEOBJECTIVES:**

1. Thesystematicinvestigationofgeologythepurposeofcreatingageologicalmap.And contour andcrosssection.
2. Toknowaboutsurveytypesandmethodsforfieldandground.**3.**Totrainthestudents tounderstandingthe surveyequipments.

3.

### UNIT-I

Surveying - Definition - Scope and Content - Types of Surveying - Area measurement -Heightdetermination-Advantages ofSurvey.

### UNIT-II

ChainSurvey-Accessibility-FMB-MethodsofChainSurvey-Triangulation

-OpenandClosedtraverse-PlottingofchainSurveyandResults.

### UNIT-III

Prismatic Compass - Parts of Prismatic Compass - Accessories - Traverse - Plotting ofPrismatic Compass - Errors and its Corrections – Bow ditich's method ofcorrection -CalculationofbearingsfromincludedAngles.

### UNIT-IV

Plane Table - Equipments - Methods of Plane Table Survey - Preparation workfor thePlane Table Survey - Leveling and Orienting the Table - Resection Points - Trial andError Method - Tracing Paper Method - Advantages and Disadvantages ofPlane TableSurvey.

### UNIT-V

Height measurement - Determination of Height - By Dumpy level- Parts of Dumpy level-Methods of dumpy level survey - Height measurement by Indian Clinometer and Abneylevel.

### REFERENCEBOOKS

1. LekhRaj&RaghunandanSingh-Mapworkandpracticalgeography.
2. Jayachandran–PracticalGeography.
3. ZamirAlvi-ATextbookofPracticalGeography.
4. PijushkantiSahaandParthaBasu-AdvancedPracticalGeography.

### B.Sc.APPLIEDGEOLOGY

**LISTOFNON-MAJORELECTIVECOURSESPAPER-IOCEANOGRAPHY**

### 21UGYN01

**COURSEOBJECTIVE:**

1. Toimpartbasicknowledgeofmorphologicalandstructuralfeatures,andoperatingprocessesinseaandoceanbasins.
2. Totrainthestudentstoinunderstandingthemarineeconomicresources.

### UNIT-I

Oceanography: Scope, Content, Significance, Distribution of Land and Sea - HypsometricCurve, Surface Configuration of the Ocean Floor: Continental Shelf, Continental Slope,Deep SeaPlain,OceanicDeeps andSubmarineCanyons.

### UNIT-II

Relief Features of the Major Oceans: Atlantic, Pacific and Indian Ocean – Horizontal andVertical Distribution of Seawater Temperature. Salinity: Factors Affecting Salinity andDistribution.

### UNIT-III

Ocean Water Circulation: Factors Influencing Ocean Circulation - General Circulation ofOcean Currents, Currents of the Atlantic, Pacific and Indian Ocean, Waves and Tides:DefinitionandTypes,Tsunamis:OriginandEffects.

### UNIT-IV

Marine Deposits: Classification and Distribution- Coral Reefstypes-Conditions for theGrowth.

### UNIT-V

MarineResources:Types-DistributionandUses-TidalEnergy-RoleofNationalInstituteofOceanographyinIndia.

### REFERENCEBOOKS

1. Anikouchine,W. A.andSternberg, R.W. (1973),The World Oceans- AnIntroductiontoOceanography,EnglewoodCliffs.
2. Garrison,T.(1998),Oceanography,WadsworthCo,USA.
3. Gerald,S.(1980),GeneralOceanography:AnIntroduction,JohnWiley& Sons,NewYork.
4. King,C.A.M.(1972),BeachesandCoasts,E.Arnold,London:King,C.A.M.(1975),OceanographyforGeographers,E. Arnold,London.
5. Ramasamy,G.(1970),Oceanography(TamilEdition),TamilNaduTextBookSociety,Chennai.
6. Sharma,R.C.andVatel,M.(1970),OceanographyforGeographers,CheytanyaPublishing House,Allahabad.

### B.Sc.APPLIEDGEOLOGY

**LISTOFNON-MAJORELECTIVECOURSESPAPERIICLIMATOLOGY**

### 21UGYN02

**COURSEOBJECTIVES:**

1. Tounderstandthemeteorologyandearthradiationbalance.
2. Toknowthebehaviourofmeteorologicalparameters.
3. TolearntheconceptofELNino impactandweatherforecasting.**4.**Tostudytheclimatechangesovergeologicalperiodanditsimpact.

### UNIT-I

Definition and Significances of Climatology - Rotation and Revolution of theEarth,Solstice, Equinox and Seasons, Elements of Weather and Climate, Composition andStructure of the Atmosphere, Isolation: factors affecting Isolation,Global energy budget,HorizontalandVerticalDistributionInversionofTemperatureandfactorsaffectingthem.

### UNIT-II

Atmospheric Pressure: Diurnal and Seasonal Variations – Vertical and Horizontaldistribution and factors affecting - Pressure Gradient - Corialies force and Deflection.Winds:CausesandTypes-Jetstream,planetarywinds,MonsoonandLocalwinds

.

### UNIT-III

Atmospheric moisture and Precipitation: Humidity types - Condensation -Cloud types -PrecipitationandRainfall:Typesandmeasurements.

### UNIT-IV

Air Masses and Fronts: types, Classification and Properties - Atmospheric Disturbances:Tropical,TemperateCyclones,ThunderstormsandTornadoes-Origin,Developmentandassociatedweather conditions.

### UNIT-V

Climatic Classification: Need and Basis of Climatic Classification- Koppen'sClimaticClassification-Weatherforecasting:Observation,TypesandUses.

### REFERENCEBOOKS

Critchfield,H.(1975),GeneralClimatology,Prentice-Hall,NewYork.Das,R.K.(1968),TheMonsoons,NationalBookTrust,NewDelhi.

Mather,J.R.(1974),Climatology,McGrawHill,NewYork.

Patterson,S.(1969),IntroductionofMeteorology,McGrawHillBookCo.,London.Stringer, E. T. (1982), Foundation of Climatology, Surjeet Publications, New Delhi.Trewartha, G. T. (198), An Introduction to Climate, International Students Edition,McGrawHill,NewYork.

Kumaraswamy,K.,etal.(2003),Climatology(TamilEdition),GracePublishers,Kumbakonam.

### B.Sc.APPLIEDGEOLOGY

**LIST OF NON-MAJOR ELECTIVE COURSES PAPER-IIIBASICGEOCHEMISTRY**

### 21UGYN03

**COURSEOBJECTIVE:**

1. To impart basic knowledge of elemental and isotopic concentrations,classificationandbehaviourofelementsinthecrust,continentallithosphericmantleand mantle.
2. Totrainthestudentstounderstandthebehaviourofgeochemicalelementsindifferentigneousrocktypes.

### UNIT-I

Origin,AbundanceandDistributionofelementsintheUniverseSolarSystemandEarth–composition of Crust, Mantle, Core, Hydrosphere and Atmosphere: GeochemicalclassificationofElements.

### UNIT-II

Basic Crystal Chemistry: Minerals as chemical compounds-bonding – IonizationPotential-Electronegativity-PeriodicTableofelements:Periodiclawanditsutility.

### UNIT-III

Geochemical processes and their geochemical signatures - Processes controlling chemicalcompositionofIgneous,Metamorphic,andSedimentaryrocks.

### UNIT-IV

GeochemistryofREE,Traceelements,stableandradiogenicisotopeandtheirapplications.

### UNIT-V

Geochemistrytomineralexploration:Elements,dispersionandhalosaroundanorebody-sampling methodology-analytical techniques: AAS-ICP-MS- Gravimeter –Chromotographyflamephotometry-DTA.

### REFERENCEBOOKS

1. Krouskoph, K.C. and D.K. Bird (1995) Introduction to Geochemistry, 3rd Ed Wiley,NewYork.
2. Mason, B. and C.B Moore, (1992), Principles of Geochemistry,4rdEdWiley, NewYork.3.Rollinson,H.(1993),UsingGeochemicalDataevaluation,preparationandinterpretation,Longman,Singapore.
3. Gill,R.C.(1997),ChemicalfundamentalsofGeology,Chapman&Hall,U.K.

### B.Sc.APPLIEDGEOLOGY

**LISTOFNON-MAJORELECTIVE COURSESPAPERIVBASICGEOPHYSICS**

### 21UGYN04

**COURSEOBJECTIVE:**

1. ToimpartknowledgeofGeophysicsandapplicationsofphysicsingeology
2. Toenhanceknowledgeandapplicationsofgeophysicsinexplorationofearthresources**.**

### UNIT-I

Definition and scope of Geophysics.Resistivity, Electrical conduction throughrocks,Range of Resistivity for Rock Sand Minerals. Measurement of Earth Resistivity:Measurement of Earth Resistance, Potential Distribution, Electrode Configuration,Configuration factor, Wenner Array, Lee Partitioning Array,Schlumberger Array, DipoleArrays,GradientArray.

### UNIT-II

Seismicpropertiesofrocks,Densitiesofvarious layersofearth(Lithosphere).Distributionof density and pressure within Earth. Survey Procedure: ElectricalProfiling, ResistivitySounding(VES),Precautions.

### UNIT-III

Heat flow: Definition – Units – Origin – Causes. Geotherms: Continental andOceanic.Heat flow measurements. Earth's magnetism: Definition – Parts of earth's magnetic field –Variation of Earth’s field – Magnetic properties of rocks and minerals – Basic outline ofPalaeomagnetism.

### UNIT-IV

Geochronology:Definition–Methods–Limitations –Radioactivityschemes

* ConcordiaandDiscordiaages.

### UNIT-V

Isostasy: Definition–Scope–DifferentTheoriesandlimitationsofIsostasy.IntroductiontoGeophysicaltools.

### REFERENCEBOOKS

Lowrie,W.F.(2008)FundamentalsofGeophysics,2ndedition,CambridgeUniversityPress,Cambridge U.K.

Anderson, D.L. (2007) Theory of Earth, 2ndedition, Cambridge University Press,CambridgeU.K.,HolmesA.L.(revisedbyDuff&Others),(1995)PhysicalGeology,5theditionELBS,London.

### B.Sc.APPLIEDGEOLOGY

**LISTOFNON-MAJORELECTIVECOURSESPAPERVGEOHAZARDS**

### 21UGYN05

**COURSEOBJECTIVES:**

1. Toexplainstudentsaboutthephysicalandgeologicalprocessescausinggeohazards.Todiscussthemethodsforquantifying geohazards.
2. Tounderstandthepossibleconsequencesaswellasriskanddisastermanagement.
3. Tomakethemawareaboutlandslides,floods,tsunamisandearthquakes,forwhichthegeologicalandphysicalprocesswere to bediscussed.
4. Todiscusspotentialinterlinkagesbetweendifferenttypesofgeohazards,disasterprevention and management and quantification and communication ofuncertainties.

### UNIT-I

GeologicalHazards:IntroductiontoNaturalHazards.Earthquakes:CausesandMeasurements–EarthquakeHazardsandRisks–EarthquakePredictionandControl

* EarthquakeCaseHistories–Tsunami.

### UNIT-II

Volcanoes, Magma, and Volcanic Eruptions- Volcanic Landforms, Volcanoesand PlateTectonics – Volcanic Hazards, Beneficial Aspects, and Predicting Eruptions- VolcanicCaseHistories.

### UNIT-III

Landslides – Mass Wasting and Mass – Wasting Processes – Slope Stability, TriggeringEvents,MassWastingHazards–Subsidence:Dissolution&HumanRelatedCauses.

### UNIT-IV

The Ocean-Atmosphere System – Thunderstorms & Tornadoes – Tropical Cyclones –Hurricane–Tornadoes–Windstorms–Lightening–Drought–FrostandFreezes–WildFire.

### UNIT-V

CoastalZones–CostalErosion–RiverSystems&CausesofFlooding–RiverFlooding–FloodingHazards,PredictionandHumanIntervention.Extra-terrestrialHazards.

Meteorites&ImpactingEvents.

### REFERENCEBOOKS

1. Montgomery,C.W.(2008),EnvironmentalGeology,McGrawHill8thEdition.
2. AbbottPatrick,L.(2006),NaturalDisasters,McGrawHill,Boston,MA.
3. Bryant,E.(2005),NaturalHazards,CambridgeUniversityPress,Cambridge,U.K.

### B.Sc.APPLIEDGEOLOGY

**LIST OF NON-MAJOR ELECTIVE COURSES PAPER VGROUNDWATERMANAGEMENTANDRAINWATERHARVESTING21UGYN06**

COURSEOBJECTIVE**:**

1. Toimpartknowledgeofglobalandnationalscenarioofwaterresourcesandassociatedchallenges.
2. Tofamiliarizeaboutoccurrenceandmovementofsub-surfacewater.Alsototrainstudentsaboutvariousgroundwatermanagementtechniques.
3. Tounderstandtheimportanceofrainwaterharvestingforwatersupplyandwilllearnaboutdifferenttypesofrainwaterharvestingsystems.
4. Togetfamiliarwithdifferentpotentialusesofrainwaterandunderstandtheadvantagesandlimitations.

5.

### UNIT-I

Groundwater development – Dynamic Equilibrium in Natural Aquifers –Groundwaterbudget–managementPotentialofAquifers–Safeyield–Waterlaw–Legalconcepts.

### UNIT-II

Parameters of groundwater balance – Conjunctive and Consumptive use.ModelingTechniquesingroundwatermanagement.GroundwaterresourcesevaluationinIndia.Estimationofrechargecomponents.

### UNIT-III

Sampling of Geological material: Types of geological samples – Precaution – Collectionand markingofsamplesandtheirlocation–Storageofsamples –OutlineofMethodology

-followedinMineral,Core,RocksandFossilsampling.Reportwriting:(purposeandscope)– Style– Clarity–Drawings and Diagram– Section.

### UNIT-IV

Groundwater Mining and Cyclic storage.Rainwater, Surface water and groundwaterinteractions.Problemsandremedial methods.Watershedmanagement.

### UNIT-V

Rainwaterharvesting:Definitionandtypes–stormwaterharvesting–rooftopharvesting–ground water recharge - storage tanks – check dams - quality developments. ConsumptiveandConjunctiveuseofwater.

### REFERENCEBOOKS

1. Todd,D.K.,(2002),GroundWater,3rdedition,JohnWiley,Singapore.
2. Fetter,C.W.(1990),AppliedHydrogeology,2ndedition,CBS,NewDelhi.
3. Karanth,K.R.(1980),GroundWaterAssessmentDevelopmentandManagement,TataMcGrawHill,NewDelhi.
4. Chaturvedi,M.C.(1987),WaterResourcesSystemsPlanningandManagement,TataMcGrawHill,NewDelhi.
5. Davis,N.S.,DeWiest,R.J.M.(1979),Hydrogeology,JohnWiley,NewYork.
6. Freeze,R.A.,Cherry,J.A.(1979),GroundWater,PrenticeHall,NewJersey.

### B.Sc. APPLIED GEOLOGYGEOLOGICALFIELDWORK

Itisanintegralpartofthecoursestudentsshouldbetakentoafieldtrainingduringtheacademicyear.

### FIRSTYEAR

Students should be taken to the local area for studying Geomorphological, Structuralaspects of geology. The duration of the trip may be a week and submit a report to thedepartment.

### SECONDYEAR

Students should be taken to nearby area and familiarize Paleontological andStratigraphical aspect, collect geological samples from the field and display at the time oftheirpracticalexamination forinternalevaluation.Thedurationmaybeaweek.

### THIRDYEAR

A visit to geologically interested and mineralized zones within Tamil Nadu it includesminevisit,geologicalmapping,minerals,rockscollectionanddisplayatthetimeoftheirpracticalexaminationfor internalevaluation.Thedurationmaybefortwoweeks.

### B.Sc. GEOGRAPHYALLIEDGEOLOGYPAPERS

|  |  |
| --- | --- |
| AlliedGeologypaper–1(21UGYA01) | ThirdSemester |
| AlliedGeologypaper–2(21UGYA02) | FourthSemester |
| AlliedGeologyPractical(21UGYAP01) | FourthSemester |

**ALLIEDGEOLOGY–I(21UGYA01)**

### UNIT-I

**GeneralGeology**:DefinitionandscopeofGeology.Originofsolarsystem:NebularandPlanetesimalhypotheses.Introduction andoutlineof constitution andcomposition ofearth'sinterior.Briefaccountoftheimportantmethodsofdeterminingtheageof the earth.

Earthquakesandtheireffects.Shortnoteonseismographandseismogram.Richter'sscaleofearthquakeintensity.Briefaccountofvolcanoes.

### UNIT-II

**Structural Geology:** Definition and scope of Structural Geology. Concept of rockOutcrop-DefinitionofDipandStrikeofRockformations.Folds:definitionandpartsofafold. Brief description of the following fold types: Anticline, Syncline, Symmetrical,Asymmetrical, Isoclinal and Recumbent folds. Brief description of thefollowing foldsystems: Anticlinorium and Synclinorium. Faults: definition and partsof a fault. Briefdescription of the following types faults: Normal, Reverse, Strike, Dip, Oblique, ParallelandStepFaults,BriefoutlineofJointsand Unconformities.

### UNIT-III

**Crystallography:**Definitionofcrystallographyandcrystals.Morphologicalcharactersofcrystals:Faces–Forms–Edges.Symmetryelements ofcrystals: Axis,Plane andCentreof symmetry. Miller's Indices. Study of the following Crystal Systems: Normal Classes oftheCubic,Tetragonal,Hexagonal,Orthorhombic,MonoclinicandTriclinicsystems.

### UNIT-IV

**MineralogyI:**DefinitionofMineralogyandMineral.Outlineofphysicalpropertiesofminerals:Color,form,luster,Hardness,Cleavage,fractureandSpecificgravity.

Description of the following minerals: Quartz. Orthoclase – Microcline – Albite –Labradorite - Anorthite.Nepheline – Leucite-Sodalite.Enstatite - Hypersthene – Augite –Diopside.

### UNIT-V

**Mineralogy II:** Description of the following minerals: Hornblende – ActinoliteTremolite.Muscovite – Biotite – Chlorite.Topaz-Olivine - Serpentine – Talc.Tourmaline – Beryl –Apatite – Corundum.Garnet-Diamond.Garnet – Beryl – Topaz – Apatite – Staurolite –Sillimanite – Epidote – Tourmaline– Corundum– Diamond.

### REFERENCEANDTEXTBOOKS

1. ParbinSingh,B.(2005),ATextbookofEngineeringandGeneralGeologyS.K.Kataria&Sons,Delhi.
2. Mukherjee,P.K.(1984),ATextbookofGeology,WorldPress,Kolkata.
3. Mahapatra,G.B.(1994),TextbookofPhysicalGeology,CBSPublishers,Delhi.
4. Mahapatra,G.B.(2000),GeneralGeology,CBSPublishers,Delhi.

### B. Sc.GEOGRAPHYALLIEDGEOLOGYPAPERS

**ALLIED GEOLOGY–II(21UGYA02)**

### UNIT-I

**Palaeontology**: Definition of Palaeontology and fossils. Outlines of modes ofpreservationin sedimentary rocks.Brief account of the uses of fossils. Study of the morphologicalcharacters and geological age of the following fossil groups: Pelecypods, Gastropods,Cephalopods,Brachiopods,Corals,andTrilobites.

### UNIT-II

**Stratigraphy:**DefinitionandscopeofStratigraphy. OutlineoftheGeologicalTimeScale.Brief account of the following geological formations in India: Dharwar Group, CuddapahGroup, Vindhyan Group, Gondwana Group, Cretaceous formationsof Tiruchirappalli andKarewaFormation.

### UNIT-III

**IgneousPetrology:**DefinitionofIgneousPetrologyandIgneousrocks.FormsofIgneousrocks: Sill, Lopolith, laccolith, Phacolith, Dyke, and Batholith. Brief description of thefollowing igneous rocks: Dunite, Pyroxenite, Gabbro, Dolerite, Syenite, Granite,Pegmatite,Aplite,Andesite, andBasalt.

### UNIT-IV

**Sedimentary Petrology:** Definition of sedimentary rocks and sedimentarypetrology.Primary structures of sedimentary rocks: Common bedding, cross- bedding, current-Bedding, graded-bedding. Surface structures: Ripple marks, Mud- cracks, and Rain prints.Brief description of the following sedimentary rocks: Sandstone, Arkose, Grit, Shale, andLimestone.

**Metamorphic Petrology:** Definition of metamorphic rocks. Metamorphism andmetamorphic process.Agents of metamorphism. Brief description of the followingsedimentary rocks: Sandstone, Arkose, Grit, Shale, and Limestone. Brief descriptionof thefollowingmetamorphicrocks:Slate,Phyllite,Schist,Gneiss,Marble,Quartzite,Granulite,andAmphibolite.

### UNIT-V

**Economic Geology:** An outline of the following processes of ore formation: Magmatic –Hydrothermal – Placer – Marine Evaporites. Brief description of the physical propertiesand Indian occurrences of the following ore and industrial minerals: Graphite, Bauxite,Magnesite, Hematite, Magnetite, Chromite, Gold, pyrolusite, pyrite, Galena, Asbestos,Gypsum, Chalk, Calcite, Dolomite, Barite, and Kaolin. Brief description of the followingcoal types: Peat, Lignite, Bituminous, andAnthracite. Brief introduction to petroleum, itsoriginandoccurrenceinIndia.

### REFERENCEANDTEXTBOOKS

1. ParbinSingh,B.(2005),ATextbookofEngineeringandGeneralGeology,S.K.Kataria&Sons,Delhi.
2. Mukherjee,P.K.(1984),ATextbookofGeology,WorldPress,Kolkata.
3. Mahapatra,G.B.(1994),TextbookofPhysicalGeology,CBSPublishers,Delhi.
4. Mahapatra,G.B.(2000),GeneralGeologyCBSPublishers,Delhi.

### B. SC. GEOGRAPHY ALLIED GEOLOGY PAPERSALLIEDGEOLOGYPRACTICAL

**Crystallography:**SimpleformsoftheNormalclassesofthe differentcrystalsystemsandmodelsrepresentingthefollowingminerals:Cubicsystem:Galena,Fluorite,andGarnet.

Tetragonalsystem:Zircon,Casseterite.Hexagonalsystem:Beryl.Orthorhombicsystem:Barite,Sulfur,Staurolite.Monoclinicsystem: Gypsum.Triclinicsystem:Axinite.

**Mineralogy:** Identification and physical description of the following minerals: QuartzGroup: Rock crystal, Chalcedony, Agate, Jasper, Flint. Feldspar Group: Orthoclase,Microcline, Albite, Perthite. Pyroxene Group: Augite, Hypersthene. Amphibole Group:Hornblende, Tremolite, Actinolite. Mica Group: Muscovite, Biotite, Chlorite. Othersilicate minerals: Olivine, Garnet, Beryl, Tourmaline, Staurolite. Non silicates:Corundum, Apatite. Ore minerals: Magnetite, Chromite,Bauxite, Pyrolusite, Pyrite,Galena,Hematite.IndustrialMinerals:Talc,Asbestos,Magnesite,Barite,Gypsum.Coalvarieties:Peat,Lignite,Bituminous,andAnthracite.

**Petrology:** Identification and physical description of the following rocks: Igneousrocks: Granite, Pegmatite, Syenite, Diorite, Gabbro, Dolerite, Dunite, Pyroxenite.Metamorphic rocks: Slate, Mica schist, Chlorite schist, Hornblende gneiss, Garnet-micagneiss, Granulite, Marble. Sedimentary rocks: Sandstone, Conglomerate, Arkose, Grit,Shale,Limestone.

**Fossils:** Identification and Morphological description of the following fossils:Pelecypods:Meretrix,Arca,Pecten,Ostrea.Gastropods:Turritella,Natica,Turbo,Conus.Cephalopods: Nautilus, Acanthoceras. Brachiopods: Terebratula, Spirifer.Trilobites:Calymene, Paradoxides. Corals: Calceola, Lithostrotion. Plant Fossils: Glossopteris,Ptilophyllum.

**Geological Maps:** Geological map drawing exercises: drawing strike lines anddeterminingdipamounts.Outcropcompletiongeologicalmapswithconformableseriesofbeds.Preparationofgeologicalphsectionsforconformableseriesofbeds.