



स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

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

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड

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

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत
राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार
पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus)
शैक्षणिक वर्ष २०२६-२७ पासून लागू
करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४-२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यात येत आहे.

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|----|--|----|---|
| 01 | B.Sc. III Year Botany | 10 | B.Sc. III Year Biochemistry |
| 02 | B.Sc. III Year Chemistry | 11 | B.Sc. III Year Agriculture Microbiology |
| 03 | B.Sc. III Year Mathematics | 12 | B.Sc. III Year Electronics |
| 04 | B.Sc. III Year Zoology | 13 | B.Sc. III Year Seed Technology |
| 05 | B.Sc. III Year Microbiology | 14 | B.Sc. III Year Horticulture |
| 06 | B.Sc. III Year Geology | 15 | B.Sc. III Year Analytical Chemistry |
| 07 | B.Sc. III Year Environment & Earth Science | 16 | B.Sc. III Year Agrochemical & Fertilizers |
| 08 | B.Sc. III Year Statistics | 17 | B.Sc. III Year Industrial Chemistry |
| 09 | B.Sc. III Year Dairy Science | 18 | B.Sc. III Year Industrial Microbiology |

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

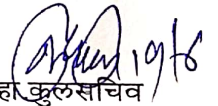
'ज्ञानतीर्थ' परिसर,

विष्णुपुरी, नांदेड - ४३१ ६०६.

जा.क्र.:शे-१ / परिपत्रक / पदवी / बीएस्सी / २०२६-२७ / 60

दिनांक : १९.०६.२०२६




सहा कुलसचिव

शैक्षणिक (१-अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :-

- १) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ
- ३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- ४) मा. संचालक, परिक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
- ५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.



**SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY,
NANDED - 431 606 (MS)**



**(Credit Framework and Structure of Four Year UG Program with
Multiple Entry and Exit Option as per NEP-2020)**

**UNDERGRADUATE PROGRAMME OF
SCIENCE & TECHNOLOGY**

Major in **GLG** and Minor in **GLG**(Subject)

Under the Faculty of Science & Technology
(Revised as per the Govt. Of Maharashtra circular dt. 13th March 2024)

2026-27

From the Desk of the Dean, Faculty of Science and Technology & Chairman, BoS in

Geology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement “*Enlightened Student: A Source of Immense Power*”, is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve *the 3Es, the equity, the efficiency and the excellence* in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high calibre graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong

learning. As a result the students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the *SukanuSamiti* given in the **NEP Curriculum Framework-2023** have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students. We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the **Government of Maharashtra regarding NEP-2020**. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory *On Job Training, Internship program* for science background students is praise worthy and certainly help the students to imbibe firsthand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Chairman, Board of Studies in Geology,
Swami Ramanand Teerth Marathwada University, Nanded

Dr. M. K. Patil

Dean

Faculty of Science and
Technology

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

| <i>Sr No</i> | <i>Name of the Member</i> | <i>Designation</i> | <i>Address</i> | <i>Contact No.</i> |
|---------------------|--------------------------------------|----------------------------|---|---------------------------|
| <i>1</i> | <i>Dr. Shaikh MD Babar,</i> | <i>Professor</i> | <i>DSM 's College of Arts, Commerce and Science College, Parbhani</i> | <i>9890184699</i> |
| <i>2</i> | <i>Dr. Udaykumar Laxmikant Sahu,</i> | <i>Associate Professor</i> | <i>Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist. Hingoli.</i> | <i>9860406757</i> |
| <i>3</i> | <i>Dr. Bhagwan Balasaheb Ghute,</i> | <i>Associate Professor</i> | <i>Toshniwal Arts, Commerce & Science College, Sengaon, Tq. Sengaon, Dist. Hingoli.</i> | <i>9130006333</i> |



Swami RamanandTeerthMarathwada University, Nanded
Faculty of Science and Technology (Three Optional in the First Year)

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

Subject: DSC (Major) /DSM (Minor 1 and Minor 2)

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

Subject: Geology

| Year & Level | Semester | (Major Core) (From the same Faculty) | (Major Elective) (From the same Faculty) | (Minor) (From the same Faculty) | Generic Elective (GE) (select from Basket 3 of Faculties other than Science and Technology) | Vocational & Skill Enhancement Course | Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) (Common across all faculties) | Field Work / Project / Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) (Common across all faculties) | Credits | Total Credits |
|--------------------------|----------|--|--|------------------------------------|---|---|--|--|---------|---------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 3 rd (5.5) | V | SGLGCT1301 (T 3Cr) Geomorphology and Photogeology (Th) SGLGCT1302 (T 3Cr) Engineering Geology and Hydrology (Th) SGLGIK1303 (T 2Cr) IKS in Disaster risk reduction SGLGCP1301 (P 2Cr) Practical based on SGLGCT1301 SGLGCP1302 (P 2Cr) Practical based on SGLGCT1302 12 Credits | SGLGET1301 (T 2Cr) Environmental Geology (Th) SGLGEP1301 (P 2Cr) Practical based on SGLGET1301 4 Credit | -- | -- | SGLGVC1301 (2Cr) Medical Geology OR Statistics in Geology SGLGSC1301 (2Cr) Water level Fluctuation OR Gemmology 4 Credits | -- | SGLGFP1301 (2 Cr) Field projects/ internship/Apprenticeship/ community Engage. Services related to major sub. 6 credit (Common across faculty) SDSCFP1301 (FP) 2 Credits | 22 | |

| | | | | | | | | | | |
|---|---|--|----|----|-----------|--|----|--|-----|--|
| VI | <p>SGLGCT1351 (T 3Cr) Stratigraphy and Geology of India (Th)</p> <p>SGLGCT1352 (T 3Cr) Economic Geology and Prospecting</p> <p>SGLGCT1353 (T 2Cr) Remote Sensing and GIS</p> <p>SGLGCP1351 (P 2Cr) Practical based on SGLGCT1351 & SGLGCT1352</p> <p>SGLGCP1352 (P 2Cr) Practical based on SGLGCT1353</p> <p>12 Credits</p> | <p>SGLGET1351 (T 2Cr) Groundwater exploration & Management (Th)</p> <p>SGLGEP1351 (P 2Cr) Practical based on SGLGET1351</p> <p>4 Cr</p> | -- | | -- | <p>SGLGVC1351 (2Cr) Computers in Geological Studies OR SGLGVC1352 (2Cr) Cartography</p> <p>2 Credits</p> | -- | <p>SGLGOJ1351 OJ : On Job Training/Field Geology and Terrain Mapping</p> <p>4 Credits</p> | 22 | |
| Cum. Cr. | 56 | 12 | 16 | 10 | 6 + 8 =14 | 14 | 18 | | 132 | |
| Exit option: B. Sc. (Bachelor in Science) with Major in <u>DSC</u> and Minor in <u>DSM</u> | | | | | | | | | | |



B. Sc. Third Year Semester V (Level 5.5)

Teaching Scheme

| Subject Course | Course Code | Course Name | Credits Assigned | | | Teaching Scheme (Hrs/ week) | | | | | | |
|---|-------------|--|------------------|-----------|-------|-----------------------------|-----------|----|----|----|----|----|
| | | | Theory | Practical | Total | Theory | Practical | | | | | |
| Major (Core course) | SGLGCT1301 | Geomorphology and Photogeology (T 3Cr) | 08 | -- | 08 | 08 | -- | | | | | |
| | SGLGCT1302 | Engineering Geology and Hydrology (T 3Cr) | | | | | | | | | | |
| | SGLGIK1303 | IKS in Disaster risk reduction (T2Cr) | | | | | | | | | | |
| | SGLGCP1301 | Practicals based on SGLGCT1301 | | | | | | -- | 02 | 04 | -- | 04 |
| | SGLGCP1302 | Practicals based on SGLGCT1302 | | | | | | -- | 02 | | -- | 04 |
| Major (Elective course) | SGLGET1301 | Environmental Geology (T 2Cr) | 02 | -- | 04 | 02 | -- | | | | | |
| | SGLGEP1301 | Environmental Geology (P 2Cr) | -- | 02 | | | | 04 | | | | |
| Minor | SDSCMT1301 | Title of paper 1 | -- | -- | -- | -- | -- | | | | | |
| | SDSCMP1301 | Title of paper 2 (practical) | -- | -- | | | | -- | | | | |
| Vocational/Skill Based Course (related to Major) | SGLGVC1301 | Medical Geology (2Cr) OR Statistics in Geology | -- | 02 | 02 | | 04 | | | | | |
| | SGLGSC1301 | Water level Fluctuation (2Cr) OR Gemmology | -- | 02 | 02 | -- | 04 | | | | | |
| OJT/Community Engagement Services (CES)/Field project | SGLGFP 1301 | (Basket 6) Field project | -- | 02 | 02 | -- | 04 | | | | | |
| Total Credits | | | 10 | 12 | 22 | 10 | 20 | | | | | |



B. Sc. Third Year Semester V (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% End Semester Assessment (ESA)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

| Subject Course (1) | Course Code (2) | Course Name (3) | Theory | | | | | Practical | | Total Marks = Col. 7+8/ Col. 9+ 10 (11) |
|---|--------------------|--|----------------------------|-------------------|-------------------|--------------|--------------|-----------|------|--|
| | | | Continuous Assessment (CA) | | | | ESA | CA | ESE | |
| | | | Test (4) | Assignment (5) | Attendance (6) | Total (7) | Total (8) | (9) | (10) | |
| Major (Core course) | SGLGCT1301 | Geomorphology and Photogeology (T 3Cr) | 15 | 09 | 06 | 30 | 45 | -- | -- | 75 |
| | SGLGCT1302 | Engineering Geology and Hydrology (T 3Cr) | 15 | 09 | 06 | 30 | 45 | -- | -- | 75 |
| | SGLGIK1303 | IKS in Disaster risk reduction (T2Cr) | 10 | 06 | 04 | 20 | 30 | -- | -- | 50 |
| | SGLGCP1301 | Practicals based on SGLGCT1301 | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| | SGLGCP1302 | Practicals based on SGLGCT1302 | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| Major (Elective course) | SGLGET1301 | Environmental Geology (T 2Cr) | 10 | 06 | 04 | 20 | 30 | -- | -- | 50 |
| | SGLGEP1301 | Environmental Geology (P 2Cr) | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| Minor | SDSCMT1301 | Title of paper 1 | -- | -- | | | | -- | -- | -- |
| | SDSCMP1301 | Title of paper 2 (practical) | -- | -- | | | | -- | -- | -- |
| Vocational/Skill Based Course (related to Major) | SGLGVC1301 | Medical Geology (2Cr) OR Statistics in Geology | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| | SGLGSC1301 | Water level Fluctuation (2Cr) OR Gemmology | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| OJT/Community Engagement Services (CES)/Field project | SGLGFP 1301 | (Basket 6) Field project | -- | -- | -- | -- | -- | 20 | 30 | 50 |

B. Sc. Third Year Semester VI (Level 5.5)

Teaching Scheme

| Subject Course | Course Code | Course Name | Credits Assigned | | | Teaching Scheme (Hrs/ week) | | | | | | |
|---|-------------|---|------------------|-----------|-------|-----------------------------|-----------|----|----|----|----|----|
| | | | Theory | Practical | Total | Theory | Practical | | | | | |
| Major (Core course) | SGLGCT1351 | Stratigraphy and Geology of India (T 3Cr) | 08 | -- | 08 | 08 | -- | | | | | |
| | SGLGCT1352 | Economic Geology and Prospecting (T 3Cr) | | | | | | | | | | |
| | SGLGCT1353 | Remote Sensing and GIS (T 2Cr) | | | | | | | | | | |
| | SGLGCP1351 | Practicals based on SGLGCT1351 | | | | | | -- | 02 | 04 | -- | 04 |
| | SGLGCP1352 | Practicals based on SGLGCT1352 | | | | | | -- | 02 | 04 | -- | 04 |
| Major (Elective course) | SGLGET1351 | Groundwater exploration & Management (T 2Cr) | 02 | -- | 04 | 02 | -- | | | | | |
| | SGLGEP1351 | Groundwater exploration & Management (P 2Cr) | -- | 02 | | -- | 04 | | | | | |
| Minor | SDSCMT1351 | Title of paper 1 | -- | -- | -- | -- | -- | | | | | |
| | SDSCMP1351 | Title of paper 2 (practical) | -- | -- | | -- | -- | | | | | |
| Skill Based Course (related to Major) | SGLGVC1351 | Computers in Geological Studies (2Cr) | -- | 02 | 02 | -- | 04 | | | | | |
| | SGLGVC1352 | OR Cartography | | | | | | | | | | |
| OJT/Community Engagement Services (CES)/Field project | SGLGOJ1351 | (Basket 6) Field project/ Field Geology and Terrain Mapping | -- | 04 | 04 | -- | 08 | | | | | |
| Total Credits | | | 10 | 12 | 22 | 10 | 20 | | | | | |



B. Sc. Third Year Semester VI (Level 5.5)

Examination Scheme

[20% Continuous Assessment (CA) and 80% End Semester Assessment (ESA)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

| Subject Course | Course Code | Course Name | Theory | | | | Practical | | Total Marks = Col. 7+8/Col. 9+10 10 (11) | |
|---|-------------|--|----------------------------|----------------|----------------|-----------|-----------|--------|---|----|
| | | | Continuous Assessment (CA) | | | ESA | CA | ESE | | |
| (1) | (2) | (3) | Test (4) | Assignment (5) | Attendance (6) | Total (7) | Total (8) | CA (9) | ESE (10) | |
| Major (Core course) | SGLGCT1351 | Stratigraphy and Geology of India (T 3Cr) | 10 | 06 | 04 | 30 | 45 | -- | -- | 75 |
| | SGLGCT1352 | Economic Geology and Prospecting (T 3Cr) | 10 | 06 | 04 | 30 | 45 | -- | -- | 75 |
| | SGLGIK1353 | Remote Sensing and GIS (T2Cr) | 10 | 06 | 04 | 20 | 30 | -- | -- | 50 |
| | SGLGCP1351 | Practicals based on SGLGCT1351 | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| | SGLGCP1352 | Practicals based on SGLGCT1352 | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| Major (Elective course) | SGLGET1351 | Groundwater exploration & Management (T 2Cr) | 10 | 06 | 04 | 20 | 30 | -- | -- | 50 |
| | SGLGEP1351 | Groundwater exploration & Management (P 2Cr) | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| Minor | SDSCMT1351 | Title of paper 1 | -- | -- | | | | -- | -- | -- |
| | SDSCMP1351 | Title of paper 2 (practical) | -- | -- | | | | -- | -- | -- |
| Vocational/Skill Based Course (related to Major) | SGLGVC1351 | Computers in Geological Studies (2Cr) | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| | SGLGVC1352 | OR Cartography (2Cr) | -- | -- | -- | -- | -- | 20 | 30 | 50 |
| OJT/Community Engagement Services (CES)/Field project | SGLGOJ1351 | (Basket 6) Field project/ Field Geology and Terrain Mapping (4Cr) | -- | -- | -- | -- | -- | 30 | 45 | 75 |

SGLGCT1301: Title (Core Major) Curriculum Details
SGLGCT1301: Geomorphology and Photogeology (Core Major) Curriculum Details
Semester V

Course pre-requisite:

- The paper is designed in order to understand the landforms of various activities of geomorphic agents. The fundamentals and applications of photogeology in geological data interpretation, field mapping etc are beneficial to students.

Course objectives:

- To identify landforms and their characteristics with reference to different geomorphic agents.
- To interpret, process and apply the spatial data for field applications.

Course outcomes:

- Student will be able to know the fundamentals and identification of Landforms.
- Both Geomorphology and Photogeology are interrelated to each other and useful for preparation of base map.

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

SGLGCT1301: Geomorphology and Photogeology (Theory 3Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|---|-------------------------------------|
| 1.0 | | Geomorphology | |
| | 1.1 | Geomorphology –Introduction, definition and scope | 12 |
| | 1.2 | Various concepts of geomorphology | |
| | 1.3 | Study of geomorphic surface features (land forms) of Fluvial action | |
| | 1.4 | Study of geomorphic surface features (land forms) Aeolian action | |
| 2.0 | | Geomorphology | |
| | 2.1 | Study of geomorphic erosional surfaces (land forms) of Glacial origin. | 11 |
| | 2.2 | Study of geomorphic depositional surfaces (land forms) of Glacial origin. | |
| | 2.3 | Study of geomorphic erosional surfaces (land forms) of Marine origin. | |
| | 2.4 | Study of geomorphic depositional surfaces (land forms) of Marine origin. | |
| 3.0 | | Photogeology | |
| | 3.1 | Photogeology - Introduction to aerial photography | 11 |
| | 3.2 | satellite imageries and preparation of photogeological maps. | |
| | 3.3 | Stereoscopic vision, orientation of stereoscope, stereo-pairs and stereo viewing of air photos, types of aerial photographs and photo index. Scale of aerial photographs. | |
| | 3.4 | Elements of aerial photo interpretation. | |
| 4.0 | | Photogeology | |
| | 4.1 | Application of Aerial photographs in the study of lithology. | 11 |
| | 4.2 | Application of Aerial photographs in the study of structure. | |
| | 4.3 | Application of Aerial photographs in the study of geomorphology. | |
| | 4.4 | Application of Aerial photographs in the study of hydrogeology. | |
| | | Total | 45 |

Text Books and Reference Books:

1. Holms Principles of Physical Geology - D. Duff.
2. Principles and Applications of Photogeology - Shiv N. Pande
3. Principles of Geomorphology - Thornmbury
4. Geomorphology – Bloom.
1. Hydrogeomorphology: Fundamentals, Applications and Techniques. Md. Babar, New India Publishing Agency.
2. Tectonic Geomorphology, Burbank, D.W. and Anderson, R.S.(2011). 2ndEdition. Blackwell Science.
3. Tectonic Geomorphology of Mountains : A new approach to palaeo-seismology, Bull,W. (2007). Blackwell Publishing.
4. Study of Landforms: A Textbook of geomorphology(2ndEdition), Small, R.J. (1978). Cambridge University Press.
5. Applied Geomorphology, Halis,J.R.(1983).
6. Indian Geomorphology. Sharma, H.S.(1990). Concept Publishing Co. New Delhi

SGLGCP1301: Practicals based on SGLG CT1301

1. Morphometric Analysis of the given Watershed/toposheet.
2. Identification and description of the Geomorphological models/Google maps
3. Identification of the Lithology, Structures and Geomorphic features or landforms from the aerial photographs

SGLGCT1302: Title (Core Major) Curriculum Details
SGLGCT1302: Engineering Geology & Hydrogeology (Core Major) Curriculum Details
Semester V

Course pre-requisite:

- The paper is divided in two units comprising Engineering Geology and Hydrogeology. The fundamentals and applications of geological investigation on Engineering projects including dams, tunnels, reservoirs etc. are beneficial to students. The students are also acquainted with the knowledge of the basics of the hydrogeology in day to day life.

Course objectives:

- To acquaint the students with geological applications in engineering projects.
- To understand, evaluate, manage and apply the groundwater condition for practical utility and applications.

Course outcomes:

- Both Engineering Geology and Hydrology are applied geology topics interrelated to each other and are useful for societal significance.

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

SGLGCT1302: Engineering Geology and Hydrogeology (Theory 3Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|---|-------------------------------------|
| 1.0 | | Engineering Geology | |
| | 1.1 | Concept and definition of engineering geology | 12 |
| | 1.2 | Concept and definition of environmental hazards | |
| | 1.3 | Geological hazards such as earthquake and volcano | |
| | 1.4 | Geological hazards such as mass movement/landslides. | |
| 2.0 | | Engineering Geology | |
| | 2.1 | Environment and geological consideration in the location and construction of engineering structures such as dams. | 11 |
| | 2.2 | Environment and geological consideration in the location and construction of engineering structures such as reservoirs. | |
| | 2.3 | Environment and geological consideration in the location and construction of engineering structures such as tunnels. | |
| | 2.4 | Drilling and its application in Engineering geology. | |
| 3.0 | | Hydrogeology | |
| | 3.1 | Introduction, hydrologic cycle | 11 |
| | 3.2 | Water table, Perched water table | |
| | 3.3 | Aquifer and its classification. Aquifer properties such as porosity, permeability | |
| | 3.4 | Specific yield, specific retention, storativity, hydraulic conductivity. Darcy's law | |
| 4.0 | | Hydrogeology | |
| | 4.1 | Occurrence of groundwater in igneous, sedimentary and metamorphic rocks. | 11 |
| | 4.2 | Hydrological prospecting | |
| | 4.3 | Concept of watershed and watershed development | |
| | 4.4 | Methods of soil and water conservation. | |
| | | Total | 45 |

Text Books and Reference Books:

1. Engineering Geology - Parbin Singh
2. Mining Geology - Arogyaswami
3. Elements of Hydrology - Vijay Singh
4. Watershed Hydrology - R. Suresh
5. Rainwater Harvesting - K. Meghashyam
6. Applied Hydrology - C.W. Fetter
7. Groundwater - H.M. Raghunath
8. Groundwater hydrology - Todd
9. Hydrogeology - Davis and Dewiest
10. Hydrogeology - Karanth
11. Groundwater Assessment - Development and Management - Karanth
12. Applied principles of Hydrogeology - Mannings.

SGLGCP1302: Practicals based on SGLG CT1302

1. Merits and demerits of the Engineering site from given Geological Structural Contour Map on the basis of section along given section line.
2. Hydrological Problems.
3. Study, preparation and analysis of hydrographs for differing groundwater conditions.
4. Water potential zones of India (map study).

SGLGCT1301: Title (IKS in Geology) Curriculum Details

SGLGCT1301: IKS in Disaster Risk Reduction Curriculum Details

Semester V

Course pre-requisite:

- The paper is designed in order to understand the Indian Knowledge System (IKS) in disaster risk reduction (DRR) through centuries-old, community-rooted practices.

Course objectives:

- To identify the sustainable, architectural, natural indicators for early warning system.
- To interpret, process and apply the IKS in resource management and disaster risk reduction.

Course outcomes:

- Students will be able to know the fundamentals of disaster risk reduction through Indian Knowledge System.
- Students will understand both Early Warning Systems and Prediction are based on indigenous natural indicators.

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

SGLGCT1301: IKS in Disaster Risk Reduction (DRR) (Theory 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|-------------------|-----------------|--|--|
| 1.0 | | Introduction to IKS | |
| | 1.1 | Definition and Scope of Indian Knowledge System (IKS) | 08 |
| | 1.2 | Various concepts of IKS | |
| | 1.3 | IKS in Natural Resource management and sustainable development | |
| | 1.4 | Historical perspectives on disasters in India and traditional response mechanisms. | |
| 2.0 | | IKS in Natural Resource Management | |
| | 2.1 | Traditional water harvesting systems (e.g., Baolis, Tankas, Eris) for drought management | 07 |
| | 2.2 | Traditional soil conservation and agricultural practices to prevent landslides and soil erosion. | |
| | 2.3 | Role of forests and sacred groves in biodiversity conservation | |
| | 2.4 | Hazard mitigation through traditional activities. | |
| 3.0 | | IKS in Indigenous Architecture and Sustainable Housing | |
| | 3.1 | Traditional wisdom and philosophies of sustainability (living in harmony with nature) | 07 |
| | 3.2 | Vernacular architecture techniques (e.g., Dhajji Dewari, Bhunga) for earthquake resilience. | |
| | 3.3 | Traditional building materials (wood, bamboo, mud) and their disaster-resistant properties. | |
| | 3.4 | Retrofitting and traditional techniques for strengthening houses. | |
| 4.0 | | Role of IKS in Disaster Preparedness | |
| | 4.1 | Role of traditional knowledge in weather forecasting and climate adaptation. | 08 |
| | 4.2 | Community-driven rescue and relief efforts based on traditional communal support systems. | |
| | 4.3 | Merging traditional knowledge with modern technology for effective DRR | |
| | 4.4 | Case studies for documenting flood, tsunami, earthquake, etc. | |
| | | Total | 30 |

Text Books and Reference Books:

1. Rajib Shaw, Anshu Sharma, and Yukiko Takeuchi. Indigenous Knowledge and Disaster Risk Reduction: From Practice to Policy, Emerald Group Publishing.
2. Eglie Indigenous Knowledge Systems in Disaster Management, Amazon.in.
3. Gopal Krishna Panda, Uday Chatterjee, et al., Indigenous Knowledge and Disaster Risk Reduction: Insight Towards Perception, Response, Adaptation and Sustainability Springer.
4. Knowledge Management in Disaster Risk Reduction - The Indian Approach (United Nations Development Programme - UNDP).
5. P. Sigamani (Author), Santosh Kumar (Author), Balu I (Author), Vigneshwaran Subbiah Akkayasamy, Disaster Risk Reduction and Management in India: Emerging Challenges and Way Forward, Bloomsbury Publications.
6. H.M. Saxena, Disaster Risk Reduction and Management, Amazon In.
7. Tirthankar Roy, Natural Disasters And Indian History, Oxford pub.

SGLGET1301: Title (Elective) Curriculum Details
SGLGET1301: Environmental Geology (Elective) Curriculum Details
Semester V

Course pre-requisite:

- The paper is divided in two units of Environmental geology. The fundamentals and applications of environmental geology studies are beneficial to students in day to day life.

Course objectives:

- To acquaint the students with the basics of environmental geology.
- To understand, evaluate, manage and sustain the environmental condition for practical utility and applications

Course outcomes:

- The environmental Geology and its applied topics are useful from the societal significance point of view.

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

SGLGET1301: Environmental Geology (Theory 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|---|-------------------------------------|
| 1.0 | | Environmental Geology | |
| | 1.1 | Environmental Geology: Definition and Concept | 08 |
| | 1.2 | Definition of ecology and Different ecosystems | |
| | 1.3 | Classification of Natural resources. | |
| | 1.4 | A short account of renewable and non-renewable resources. | |
| 2.0 | | Environmental Geology | |
| | 2.1 | Environmental problems due to surface geological processes. Causes, hazards and remedial measures relating to landslides. | 07 |
| | 2.2 | Environmental problems due to surface geological processes. Causes, hazards and remedial measures relating to floods. | |
| | 2.3 | Environmental problems due to surface geological processes. Causes, hazards and remedial measures relating to soil erosion. | |
| | 2.4 | Impact of wind on environment. | |
| 3.0 | | Environmental Geology | |
| | 3.1 | Degradation of coastal environment and measures for Coastal Protection. | 07 |
| | 3.2 | Influence of deep seated earth geological processes on environment | |
| | 3.3 | Earthquake hazards, Earthquake prediction control and warning | |
| | 3.4 | Hazards of volcanism; Techniques of volcanic prediction and human adjustments to volcanic environments. | |
| 4.0 | | Environmental Geology | |
| | 4.1 | Man as an agent of environmental modifications. | 08 |
| | 4.2 | Environmental degradation due to mining and mineral processing. | |
| | 4.3 | Effects of urbanization on surface water, causes for ground water pollution. | |
| | 4.4 | An outline on Global Warming and Climate changes. | |

| | | | |
|--|--|--------------|-----------|
| | | Total | 30 |
|--|--|--------------|-----------|

Text Books and Reference Books:

1. Environmental Geology Valdiya, K.S.(2013). 2nd Edition. McGraw Hill Education
2. Environmental Geology - James S. Reichard, *McGraw Hill*
3. Introduction to Environmental Geology - Edward A. Keller, *Pearson*
4. Principles of Engineering Geology and Geotectonics - D. K. Krynine and W. R. Judd, *CBS Publishers.*
5. Environmental Geology - C. Montgomery, *John Wiley and Sons.*
6. Elements of Environmental Engineering - K.N. Duggal, *S. Chand and Co., New Delhi*
7. Environmental Engineering and Sanitation - Salvato Joseph A, *John Wiley & Sons.*
8. Environmental Protection - Emil T. Chanlett, *McGraw Hill Inc.*

SGLGEP1301: Practicals based on SGLG ET1301

1. Water analysis.
2. Soil analysis.
3. Plotting and interpretation of geochemical data.
4. Preparation of hazard Zonation map.

SGLGCT1351: Title (Core Major) Curriculum Details
SGLGCT1351: Stratigraphy and Geology of India (Core Major) Curriculum Details
Semester VI

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|--|
| <p>Course pre-requisite:</p> <ul style="list-style-type: none"> The paper is designed for the understanding of the geological formations in different parts of India through geological ages from studying the rock strata which will in turn, help in building the geological history of Indian subcontinent. <p>Course objectives:</p> <ul style="list-style-type: none"> To acquaint the students with geological formations all over India. To understand the time relevance and occurrence of minerals and rock formations of India. <p>Course outcomes:</p> <ul style="list-style-type: none"> The topics on Stratigraphy of India are very important from the point of view of general information on the geology of India. These topics are useful for knowledge and understanding geology of India. |
|--|

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

SGLGCT1351: Stratigraphy and Geology of India (Theory 3Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|--|-------------------------------------|
| 1.0 | | Stratigraphy | |
| | 1.1 | Introduction, Principles of stratigraphy. | 11 |
| | 1.2 | Standard Geological Timescale and units of stratigraphy | |
| | 1.3 | Principles of correlation | |
| | 1.4 | Physiographic divisions of India | |
| 2.0 | | Geology of India | |
| | 2.1 | Occurrence, distribution, classification, lithology and economic importance of super groups/groups: Archean of central province, Singhbhum, Eastern Ghats, Delhi, Dharwar. | 12 |
| | 2.2 | Occurrence, distribution, classification, lithology and economic importance of Cuddupah super group. | |
| | 2.3 | Occurrence, distribution, classification, lithology and economic importance of Vindhyan super-group. | |
| | 2.4 | Occurrence, distribution, classification, lithology and economic importance of Gondwana and Deccan Trap super-groups. | |
| 3.0 | | Geology of India | |
| | 3.1 | Occurrence, distribution, classification, lithology and economic importance of Geology of Kashmir | 11 |
| | 3.2 | Occurrence, distribution, classification, lithology and economic importance of Geology of Spiti valley | |
| | 3.3 | Occurrence, distribution, classification, lithology and economic importance of Geology Siwalik Group of India | |
| | 3.4 | Siwalik Mammals | |
| 4.0 | | Geology of India | |
| | 4.1 | Occurrence, distribution, classification, lithology and economic importance of Marine formations of Jurassic of Kutch. | 11 |
| | 4.2 | Occurrence, distribution, classification, lithology and economic importance of Cretaceous of Tiruchirapalli | |
| | 4.3 | Occurrence, distribution, classification, lithology and economic importance of Tertiary rocks of Assam. | |
| | 4.4 | Occurrence, distribution, classification, lithology and economic importance of Geology of Indo-Gangatic alluvial Plain. | |
| | | Total | 45 |

Text Books and Reference Books:

1. Holms Principles of Physical Geology - D. Duff
2. Geology of India and Burma - M.S. Krishnan, CBS Publishers, Delhi
3. Geology of India - D.N. Wadia, Macmillan India Pvt. Ltd.
4. Fundamental of Historical Geology - Ravindra Kumar
5. Mehar D.N. Wadiya (2021).Minerals Of India. National Book Trust of India
6. Ramakrishnan, M. &Vaidyanadhap, R. 2008. Geology of India Vol. 1 & 2, geological society of India, Bangalore.
7. Valdiya, K.S. 2010. The making of India, Macmillan India Pvt. Ltd

SGLGCP1351: Practicals based on SGLG CT1351

1. Identify and locate the Geological Formations on a given map of India.
2. Study of rocks in hand specimens from known Indian stratigraphic horizons
3. Plotting major tectonic units in the outline map of India
4. Plotting important geological formations in graphical log.

SGLGCT1352: Title (Core Major) Curriculum Details

SGLGCT1352: Economic Geology and Prospecting (Core Major) Curriculum Details Semester VI

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|---|
| <p>Course pre-requisite:</p> <ul style="list-style-type: none"> The paper is divided in two sections namely Economic Geology and Prospecting. The section-I is dedicated to understand the process of formation of economic mineral and their distribution in different parts of India. The second section concentrate on the evaluation, extraction and monitoring of the mineral bodies and rock formations through various methods of prospecting. <p>Course objectives:</p> <ul style="list-style-type: none"> To acquaint the students with the process of formation and distribution of economic minerals of India.. To understand, evaluate, manage and apply the prospecting method for practical utility and applications. <p>Course outcomes:</p> <ul style="list-style-type: none"> Both Economic Geology and Prospecting are applied geology topics interrelated to each other and are useful for societal benefits. |
|---|

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

SGLGCT1352: Economic Geology and Prospecting (Theory 3Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|--|-------------------------------------|
| 1.0 | | Economic Geology | |
| | 1.1 | Introduction of economic Geology. | 12 |
| | 1.2 | Magma and mineral deposits. Metallic and non-metallic ore deposits. | |
| | 1.3 | Processes of formation of mineral deposits such as: Magmatic concentration, sublimation, metasomatism, metamorphism. | |
| | 1.4 | Processes of formation of mineral deposits such as: hydrothermal process, supergene sulphide enrichment, sedimentation, residual and mechanical concentration. | |
| 2.0 | | Economic Geology | |
| | 2.1 | Occurrence, geological and geographical distribution and uses of mineral deposits of India: Iron, chromites and copper. | 11 |
| | 2.2 | Occurrence, geological and geographical distribution and uses of mineral deposits of India: manganese, lead & zinc and gold. | |
| | 2.3 | Occurrence, geological and geographical distribution and uses of mineral deposits of India: bauxite, gypsum, asbestos & mica. | |
| | 2.4 | Occurrence, geological and geographical distribution and uses of mineral deposits of India: uranium, precious and semiprecious stones. | |
| 3.0 | | Prospecting | |
| | 3.1 | Introduction to Geophysical method of prospecting | 11 |
| | 3.2 | Geophysical method of prospecting (Instrument, field procedure and interpretation) based on magnetic method. | |
| | 3.3 | Geophysical method of prospecting (Instrument, field procedure and interpretation) based on gravity studies. | |
| | 3.4 | Geophysical method of prospecting (Instrument, field procedure and interpretation) based on electrical method of prospecting. | |
| 4.0 | | Prospecting | |
| | 4.1 | Geophysical method of prospecting (Instrument, field procedure and interpretation) based on seismic studies. | 11 |
| | 4.2 | Geological method of prospecting. | |
| | 4.3 | Geochemical method of prospecting. | |
| | 4.4 | Leakage anomalies and pathfinder elements. | |
| | | Total | 45 |

Text Books and Reference Books:

1. Exploration of Geophysics - V.L.S. Bhimashankaran
2. General and Applied Geophysics - Kaul, Bhattacharya and Sengupta
3. Introduction to Geophysical Prospecting - Dorbin
4. Studies of Mineral deposits - Smrinov, Ginzburg and Others
5. Ore Deposits of India - KVGK Gokhale and T.C. Rao
6. Economic Mineral Deposits – Bateman, Freeman & Co.
7. Minerals of India. Mehar D.N. Wadiya. National Book Trust of India.
8. Industrial minerals and rocks of India. Deb, S. 1980. Allied Publishers.
9. Ore Geology and Industrial minerals. Evans, A.M. 1993. John Wiley.
10. Indian Mineral Wealth. Brown, C. and Dey, A.K.(1955). Oxford University

SGLGCP1351: Practicals based on SGLG CT1351

1. Sub-surface information of the area with the help of Resistivity Meter.
2. Identification and description of the Physical Properties of Ore Minerals.
3. Describe and locate the occurrence of Ore Minerals in the given map of India.

4. SGLGCT1353: Title (Core Major) Curriculum Details

SGLGCT1353: Remote Sensing and GIS Curriculum Details Semester VI

Course pre-requisite:

- This course intends to acquaint with students to the basic principles and techniques of remote sensing, elementary properties of electromagnetic radiation and its interaction with matter, fundamentals of digital image processing and image interpretation techniques.

Course objectives:

- To understand the fundamental usage of Remote sensing techniques.
- To introduce the students to the fundamentals of geographical information system.

Course outcomes:

- The student will be appraised with the theoretical knowledge, information and skills to use remotely sensed data, image processing techniques.
- The student will acquire the knowledge of application of GIS techniques for geological applications.

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

SGLGCT1353: Remote Sensing and GIS (Theory 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|---|-------------------------------------|
| 1.0 | | Remote Sensing 1 | |
| | 1.1 | Fundamentals of remote sensing and historical development in India | 08 |
| | 1.2 | Electromagnetic spectrum | |
| | 1.3 | Interaction of electro-magnetic radiation with Earth's atmosphere and surface features; atmospheric window; sensors and platforms | |
| | 1.4 | Advantages and limitations of remote sensing. | |
| 2.0 | | Remote Sensing 2 | |
| | 2.1 | Introduction to optical, thermal, microwave and hyper-spectral remote sensing | 07 |
| | 2.2 | Satellite remote sensing: | |
| | 2.3 | Geosynchronous and sun synchronous orbit | |
| | 2.4 | Concept of digital image; sensor resolution; panchromatic and multi-spectral images | |
| 3.0 | | Remote Sensing 3 | |
| | 3.1 | Principles of digital image processing | 07 |
| | 3.2 | Image pre-processing; image enhancement; multi-image manipulation; image classification | |
| | 3.3 | False colour composite (FCC) | |
| | 3.4 | Elements of image interpretation. | |
| 4.0 | | Geographical Information System (GIS) | |
| | 4.1 | Fundamentals of geographical information system (GIS) | 08 |
| | 4.2 | Data structure, spatial and attribute data | |
| | 4.3 | Spatial and 3D data analysis and visualization | |
| | 4.4 | Applications of GIS in Geology | |
| | | Total | 30 |

Text Books& Reference Books:

1. Fundamentals of Remote Sensing - George Joseph and C. Jeganathan, *Universities Press*
2. Image Interpretation in Geology - S. A. Drury, *Nelson Thornes*
3. Principles and Applications of Photogeology - S. N. Pandey, *New Age International, Delhi*
4. Principles of Geographical Information Systems - P. A. Burrough, R. A. McDonnell and C. D. Lloyd, *Oxford University Press*
5. Remote Sensing and GIS - B. Bhatta, *Oxford University Press*
6. Remote Sensing Geology - R. P. Gupta, *Springer-Verlag*
7. Introducing Geographic Information Systems with ArcGIS: A Workbook Approach to Learning GIS - Michael D. Kennedy, Michael F. Goodchild and Jack Dangermond, *Wiley*
8. Introduction to Geographic Information Systems - Kang-tsung Chang, *McGraw-Hill*
9. Introduction to Microwave Remote Sensing - Iain H. Woodhouse, *CRC Press*
10. Introductory Digital Image Processing: A Remote Sensing Perspective - John R. Jensen, *Pearson Education, Inc.*
11. Learning QGIS - Anita Graser, *Packt Publishing Limited*
12. Remote Sensing Digital Image Analysis: An Introduction - John A. Richards, *Springer*
13. Remote Sensing Handbook (Vols. 1-3) - Prasad S. Thenkabali, *CRC Press*

SGLGET1351: Title (Elective) Curriculum Details

SGLGET1351: Groundwater Exploration and Management (Elective)

Curriculum Details Semester VI

Course pre-requisite:

- The paper is divided in two units comprising Groundwater Exploration and Management. The fundamentals and applications of geological investigation on groundwater exploration are beneficial to students. The students are also acquainted with the knowledge of the storage, consumption, conservation and management of Groundwater in day to day life.

Course objectives:

- To acquaint the students with Groundwater exploration.
- To understand, evaluate and manage the groundwater for future storages

Course outcomes:

- Both Groundwater Exploration and Management are applied geology topics interrelated to each other and are useful for societal significance.

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

SGLGET1351: Groundwater Exploration and Management (Theory 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|--------------|----------|--|-------------------------------------|
| 1.0 | | Groundwater Exploration | |
| | 1.1 | Introduction: Definition of Hydrology, Scope and applications of Hydrogeology. | 08 |
| | 1.2 | Hydrological Evaporation, Condensation, Precipitation, Infiltration, Transpiration. Evapotranspiration, Runoff, connate water. | |
| | 1.3 | Groundwater: Origin, Occurrence and age of groundwater, Vertical distribution of sub-surface water, zone of aeration-soil water, vadose water and capillary fringe. | |
| | 1.4 | Zone of saturation - water table. Perched water table. Recharge & discharge areas. | |
| 2.0 | | Groundwater Exploration | |
| | 2.1 | Aquifers: Definition of aquifer, Aquitard, Aquiclude, Aquifuge. Properties of Aquifer - porosity, retention of water in rocks, yield of water from rocks (specific yield and specific retention) | 07 |
| | 2.2 | Darcy's law, permeability, hydraulic conductivity, velocity of groundwater flow, storage co-efficient. | |
| | 2.3 | Types of aquifers: confined, semi-confined, and unconfined. Homogeneous, Heterogeneous. Isotropic and Anisotropic aquifers. | |
| | 2.4 | Igneous, sedimentary and metamorphic rocks as aquifers. | |
| 3.0 | | Groundwater Management | |
| | 3.1 | Quality of Ground Water: Physical, chemical and Biological characteristics of groundwater. | 07 |
| | 3.2 | Suitability of groundwater for drinking, Irrigation and industrial purposes. | |
| | 3.3 | Groundwater Investigations and management techniques: Geological, hydrogeological and Geobotanical | |
| | 3.4 | Brief account of Remote Sensing techniques and Geophysical Exploration | |
| 4.0 | | Groundwater Management | |
| | 4.1 | Groundwater balance, recharge, (natural and artificial) and discharge. | 08 |
| | 4.2 | Conjunctive use of surface and groundwater and measures of groundwater management | |
| | 4.3 | Groundwater resource evaluation-water table fluctuation method and rainfall infiltration methods. | |
| | 4.4 | Aquifer system of India | |
| Total | | | 30 |

Text Books&ReferenceBooks:

1. Elements of Hydrology - Vijay Singh
2. Watershed Hydrology - R. Suresh
3. Rainwater Harvesting - K. Meghashyam
4. Applied Hydrology - C.W. Fetter
5. Groundwater - H.M. Raghunath
6. Groundwater hydrology - Todd
7. Hydrogeology - Davis and Dewiest
8. Hydrogeology - Karanth
9. Groundwater Assessment - Development and Management - Karanth
10. Applied principles of Hydrogeology - Mannings.

SGLGEP1351: Practicals based on SGLG ET1351

1. Sub-surface information of the area with the help of Borehole data and well inventory.
2. Groundwater exploration by Resistivity Survey.
3. Pumping test of wells.
4. Analysis of rainfall data.
5. Preparation of water level contour maps and their interpretation

SGLGVC1301: Vocational Skill Course (VSC) Curriculum Details

SGLGVC1353: Medical Geology Curriculum Details

Semester V

Course pre-requisite:

- The paper is designed in order to understand the basics of geogenic and anthropogenic distribution of trace elements, their toxic effects on human health and that of plant and animals.

Course objectives:

- To introduce the basic concepts of medical geology.
- To identify interaction between abundances of elements and isotopes and the health of humans and plants.

Course outcomes:

- Student will be able to know the distribution of trace elements and its cyclic movement through the abiotic-biotic environment and their influence on human health, plant and animals.

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

SGLGVC1301: Medical Geology (Practical 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|-------------------|-----------------|--|--|
| 1.0 | | Medical Geology 1 | |
| | 1.1 | Basic concepts of medical geology | 08 |
| | 1.2 | Natural distribution and abundance of elements | |
| | 1.3 | Anthropogenic sources of elements | |
| | 1.4 | Element consumption by humans | |
| 2.0 | | Medical Geology 2 | |
| | 2.1 | Biological functions and responses of elements | 07 |
| | 2.2 | Geological impacts on nutrition | |
| | 2.3 | Elements used in cure of diseases | |
| | 2.4 | Sources of disease curing minerals and hot-springs | |
| 3.0 | | Medical Geology 3 | |
| | 3.1 | Geospatial analysis as a tool in epidemiology | 07 |
| | 3.2 | Health hazards associated with volcanic eruptions | |
| | 3.3 | Global dust flux and respiratory problems | |
| | 3.4 | Impacts of fluorides, radon, arsenic, selenium, mercury, iodine, and uranium on physiological function | |
| 4.0 | | Medical Geology 4 | |
| | 4.1 | Carcinogenic associations with coal and fibrous minerals | 08 |
| | 4.2 | Geological effects on animal health | |
| | 4.3 | Geophagy (human ingestion of soil materials as a dietary supplement) | |
| | 4.4 | Bridging earth sciences with public health. | |
| | | Total | 30 |

Text Books and Reference Books:

1. A History of Geology and Medicine - C.J. Duffin, R.T.J. Moody and C.G.-Thorpe (Eds), *The Geological Society London*
2. Elements of Geochemistry, Geochemical Exploration and Medical Geology - K.R. Randive, *Research Publishing*
3. Geology and Health: Closing the Gap – H. Catherine, W. Skinner and A. R. Berger (Eds), *Oxford University Press*
4. Medical Geology: A Regional Synthesis - O. Selinus, R. B. Finkelman and J.A. Centeno, *Springer*
5. Practical Applications of Medical Geology - M. Siegel, O. Selinus and R. Finkelman (Eds), *Springer*
6. Progress in Medical Geology - M. Ibaraki and H. Mori (Eds.), *Cambridge Scholars Publishing*
7. Medical Geology: Effects of Geological Environments on Human Health (Vol. 2) – Miomir Komatina, *Elsevier*.
8. Environmental Radioactivity from Natural, Industrial, and Military Sources - M. Eisenbud and T. Gesell, *Academic Press*
9. Essentials of Medical Geology: Impacts of the Natural Environment on Public Health – Olle Selinus, *Academic Press*.
10. Introduction to Medical Geology - C. B. Dissanayake and R. Chandrajith, *Springer-Verlag*
11. Medical Geochemistry: Geological Materials and Health - P. Censi, T.H. Darrah and Y. Erel (Eds), *Springer*

SGLGVC1301: Practicals based on SGLGVC1301

- 1) Geochemical Mapping and Analysis of Soil and water.
- 2) Geospatial mapping in various diseases.
- 3) Identifying harmful mineral dust (e.g., asbestos) and studying their effects on respiratory health.
- 4) Examining the antibacterial properties of specific clays.
- 5) Chemical fertilisers and its impacts on human health

SGLGVC1302: Vocational Skill Course (VSC) Curriculum Details

SGLGVC1302: Statistics in Geology Curriculum Details **Semester V**

Course pre-requisite:

- The course is essential to have understanding of the basics of statistics and its application in Geological Studies.

Course objectives:

- To acquaint the students with the fundamentals of statistics.
- To introduce the students with the application of statistics in analyzing various geological data.

Course outcomes:

- Student will be able to apply basic statistical tools in analyzing different types of geological data.

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

SGLGCT1352: Statistics in Geology (Theory 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|--|-------------------------------------|
| 1.0 | | Introduction to Statistics | |
| | 1.1 | Introduction to statistics | 08 |
| | 1.2 | Mean, Mode, Median | |
| | 1.3 | Range, Variance and Standard Deviation | |
| | 1.4 | Basic concept of probability | |
| 2.0 | | Methods of Statistical Sampling | |
| | 2.1 | Population and sample | 07 |
| | 2.2 | Graphical representation of geological data | |
| | 2.3 | Basic concept of probability and probability distribution of geological data | |
| | 2.4 | Measures of central tendency | |
| 3.0 | | Statistical Applications 1 | |
| | 3.1 | Dispersion, kurtosis and their applications in geology | 07 |
| | 3.2 | Correlation and regression | |
| | 3.3 | Time series analysis; trend surface analysis | |
| | 3.4 | Distribution of data | |
| 4.0 | | Statistical Applications 2 | |
| | 4.1 | Test of significance and confidence level | 08 |
| | 4.2 | Null hypothesis | |
| | 4.3 | Alternate hypothesis | |
| | 4.4 | z-test and t-test | |
| | | Total | 30 |

Text Books and Reference Books:

1. Fundamentals of Mathematical Statistics - S. C. Gupta and V. K. Kapoor, *S.Chand*.
2. Geostatistics with Applications in Earth Sciences - D. D. Sarma, *Springer*
3. Statistics and Analysis of Scientific Data - Massimiliano Bonamente, *Springer*
4. Statistical Methods- S. P. Gupta, *Sultan Chand*
5. Statistics and Data Analysis in Geology- J. C. Davis, *Wiley India*
6. Geostatistics Explained: An Introductory Guide for Earth Scientists - Steve McKillup and Melinda Darby Dyar, *Cambridge University Press*
7. Applied Geostatistics - Edward H. Isaaks and R. Mohan Srivastava, *Oxford University Press*.

SGLGVC1302: Practicals based on SGLGVC1302

1. Problems related to the use of statistical concepts in Geological data analysis
2. Determination of Mean, Mode and Median of the given data.
3. Calculation of Range, Variance and Standard Deviation from the given data set.
4. Dispersion, kurtosis and their applications in geology

SGLGSC1301: Skill Enhancement Course (SEC) Curriculum Details

SGLGSC1301: Water Level Fluctuation Curriculum Details Semester V

Course pre-requisite:

- The paper is designed in order to understand the Influence of water level fluctuation on society need, agricultural need and on environment.

Course objectives:

- To provide comprehensive knowledge to the students in aquifers, groundwater flow, artificial groundwater recharge techniques, well hydraulics and groundwater models.

Course outcomes:

- Student will be able to know the fundamentals and characteristics of water level fluctuation.
- Students will be acquainted with the artificial recharge, managed aquifer recharge, and rainwater harvesting to restore groundwater levels

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

SGLGSC1301: Water Level Fluctuation (Practical 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|---|-------------------------------------|
| 1.0 | | Fundamentals of Water Level Fluctuations | |
| | 1.1 | Definition of water table and piezometric surface | 08 |
| | 1.2 | The distinction between confined and unconfined aquifers | |
| | 1.3 | Causes of Fluctuation: Natural Factors: Seasonal variations (recharge vs. discharge), heavy rainfall, evapotranspiration, and meteorological effects (atmospheric pressure changes, wind, tidal effects). | |
| | 1.4 | Anthropogenic Causes: Over-exploitation/groundwater pumping, irrigation demands, urbanization, and land-use changes (deforestation) | |
| 2.0 | | Monitoring and Analysis Techniques | |
| | 2.1 | Well logging, observation wells, and techniques for measuring water depth | 07 |
| | 2.2 | Hydrographs (plotting water level vs. time), water table contour maps | |
| | 2.3 | GIS-based mapping | |
| | 2.4 | A standard technique to estimate groundwater recharge by analyzing water-level changes | |
| 3.0 | | Impact and Environmental Influences | |
| | 3.1 | Environmental Effects: Waterlogging in canal commands | 07 |
| | 3.2 | Reduction in base flow, and the drying of wetlands | |
| | 3.3 | Saline Water Intrusion | |
| | 3.4 | Consequences of overexploitation | |
| 4.0 | | Modeling and Management | |
| | 4.1 | Statistical/stochastic models (time series analysis) and mathematical modelling of water level changes | 08 |
| | 4.2 | Artificial recharge, managed aquifer recharge, and rainwater harvesting to restore levels | |
| | 4.3 | Groundwater regulation, legislation, and sustainable management practices | |
| | 4.4 | Preparation of groundwater hydrographs and water table maps. | |
| | | Total | 30 |

Text Books and Reference Books:

1. Elements of Hydrology - Vijay Singh
2. Rainwater Harvesting - K. Meghashyam
3. Applied Hydrology - C.W. Fetter
4. Groundwater - H.M. Raghunath
5. Groundwater hydrology - Todd
6. Hydrogeology - Davis and Dewiest
7. Hydrogeology - Karanth
8. Applied principles of Hydrogeology - Mannings.

SGLGSC1301: Practicals based on SGLGSC1301

1. Well logging and inventory of observation wells
2. Techniques for measuring water level depth
3. Hydrographs (plotting water level vs. time)
4. Preparation of water table contour maps

SGLGSC1302: Skill Enhancement Course (VSC) Curriculum Details

SGLGVC1302: Gemology Curriculum Details

Semester V

Course pre-requisite:

- The paper is designed in order to understand the course is to introduce the basic concepts involved in the study of gem stones, their identification and testing methods beneficial to students.

Course objectives:

- To identify and describe the physical characteristics of gem stones.
- To interpret the testing methods and applications of gemstones.

Course outcomes:

- Student will be able to know the physical characteristics, identification and occurrence of gemstones.
- Student will also learn about the different techniques involved in identification of natural and synthetic gemstones.

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

SGLGCT1302: Gemology (Practical 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|-------------------|-----------------|---|--|
| 1.0 | | Gemology | |
| | 1.1 | Introduction to gems | 08 |
| | 1.2 | Basic properties of gems | |
| | 1.3 | Formation of gem stones | |
| | 1.4 | Use of refractometers | |
| 2.0 | | Gemology | |
| | 2.1 | Polariscope and dichroscope | 07 |
| | 2.2 | Causes of colours in gemstones | |
| | 2.3 | Introduction to special optical properties like chatoyancy, asterism, luminescence, play of colours, labradorescence, inclusions etc. | |
| | 2.4 | Distinction between synthetic and natural gem stones. | |
| 3.0 | | Gemology | |
| | 3.1 | Use of gem testing instruments: hand lens (10x) | 07 |
| | 3.2 | detection of double refraction, by observing pleochroic colours with the dichroscope | |
| | 3.3 | Identification of gemstones on the basis of pleochroic colours | |
| | 3.4 | Detection of double refraction | |
| 4.0 | | Gemology | |
| | 4.1 | Interference figures and internal strain with the polariscope | 08 |
| | 4.2 | Study of the fluorescent colours exhibited by various gemstones under ultraviolet (long wave and short wave) light | |
| | 4.3 | Measurement of refractive indices | |
| | 4.4 | Birefringence tests using a gem-testing refractometer | |
| | | Total | 30 |

Text Books and Reference Books:

1. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
2. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
3. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby & Co
4. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
5. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
6. Stephen E. Kesler and Adam C. Simon (2015). Mineral Resources Economics and the Environment. Cambridge University Press.
7. Mehar D.N. Wadiya (2021). Minerals Of India. National Book Trust of India

SGLGSC1302: Practicals based on SGLGSC1302

1. Identification and description of gemstones
2. Analyzing the absorption spectrum to identify the coloring agents within a gem
3. Identification and description special optical properties like chatoyancy, asterism, luminescence, play of colours, labradorescence, inclusions etc
4. Calculating the density of a stone using hydrostatic weighing
5. Determination of Refractive Index (RI) using a refractometer

SGLGVC1351: Vocational Skill Course (VSC) Curriculum Details

SGLGVC1351: Computers in Geological Studies Curriculum Details Semester VI

Course pre-requisite:

- The paper is designed in order to understand the use of computer in the Geological studies. The fundamentals and applications of computers in geological data interpretation, field mapping etc are beneficial to students.

Course objectives:

- To study basics of computer applications in the geological data interpretation.
- To interpret, process and apply the geological data for computer based applications.

Course outcomes:

- Student will be able to know the fundamentals computer applications in geological data interpretation.
- Use of computers and software as tools in the areas of geological problem-solving.

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

SGLGVC1351: Computers in Geological Studies (Practical 2Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|-------------------|-----------------|--|--|
| 1.0 | | Fundamentals of Computers | |
| | 1.1 | Introduction to computers | 08 |
| | 1.2 | Input / Output and Central Processing Unit (CPU) | |
| | 1.3 | Memory Device | |
| | 1.4 | Parts of computer system | |
| 2.0 | | Fundamentals of Computers | |
| | 2.1 | Types of computers | 07 |
| | 2.2 | Characteristics of Computer. | |
| | 2.3 | History of Computers | |
| | 2.4 | Generations of Computer | |
| 3.0 | | Internet and emails | |
| | 3.1 | Introduction to Internet | 07 |
| | 3.2 | E-mail Account and its Functions | |
| | 3.3 | Search Engine and Surfing WebPages | |
| | 3.4 | Basics of Social Networking Site | |
| 4.0 | | Computer Applications in Geological studies | |
| | 4.1 | Use of computers and software as tools in the areas of geological problem-solving, | 08 |
| | 4.2 | Report-writing | |
| | 4.3 | Presentations for Geological studies | |
| | 4.4 | Brief idea about computer software used in earth sciences | |
| | | Total | 30 |

Text Books and Reference Books:

1. Berry, L.G., Mason, B. and Dietrich, R.V., 1982. Mineralogy. CBS Publ.
2. Nesse, D.W., 1986. Optical Mineralogy. McGraw Hill.
3. Read, H.H., 1968. Rutley's Element of Mineralogy (Rev. Ed.). Thomas Murby and Co
4. Flint, Y., 1975. Essential of crystallography, Mir Publishers.
5. Phillips, F.C., 1963. An introduction to crystallography. Wiley, New York.
6. Stephen E. Kesler and Adam C. Simon (2015). Mineral Resources Economics and the Environment. Cambridge University Press.
7. Mehar D.N. Wadiya (2021). Minerals Of India. National Book Trust of India

SGLGVC1351: Practicals based on SGLGVC1351

1. Data Analysis: Windows, word, Excel, Surfer etc.
2. Importing GPS data, satellite imagery, and aerial photographs onto a mobile device to visualize geological data
3. Use of computers and software as tools in the areas of geological problem-solving.
4. Usage of Paint and Corel draw for Geological map preparation.

SGLGVC1352: Cartography

Curriculum Details

Semester VI

Course pre-requisite:

- The paper is designed in order to understand the use of computer in the Geological studies. The fundamentals and applications of computers in geological data interpretation, field mapping etc are beneficial to students.

Course objectives:

- To study basics of computer applications in the geological data interpretation.
- To interpret, process and apply the geological data for computer based applications.

Course outcomes:

- Student will be able to know the fundamentals computer applications in geological data interpretation.
- Use of computers and software as tools in the areas of geological problem-solving.

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|------------|----------|--|-------------------------------------|
| 1.0 | | History of Cartography | |
| | 1.1 | Terms and definition, Map projections and references, speriods, Map numbering systems. | 08 |
| | 1.2 | Base map and Thematic maps, | |
| | 1.3 | Map legend symbols and border information. | |
| | 1.4 | Designing and layouts of the maps. | |
| 2.0 | | Types of Maps | |
| | 2.1 | Small scales, large scales and medium scales maps,, | 07 |
| | 2.2 | Choropleth map, Socioeconomic maps, | |
| | 2.3 | Geological maps, Forest maps, Agriculture map, Water resources map, Water quality map | |
| | 2.4 | Soil survey map, Land scope map, Map for hot spots and Maps published the Survey of India. | |
| 3.0 | | Map Projections | |
| | 3.1 | Types of projections, orthographic projections, | 07 |
| | 3.2 | Projections Lambada. Mercater project, | |
| | 3.3 | Lambader cylindricals projections, | |
| | 3.4 | Global projections, Conic projections. | |
| 4.0 | | Thematic mapping | |
| | 4.1 | Cadastral maps, Topographical maps, Agricultural maps,, related to data. | 08 |
| | 4.2 | Population maps, Cultural maps. Structural and statistical graphs | |
| | 4.3 | Agricultural data, Pollutions, Cultural and Cadastral data. | |
| | 4.4 | Types of graph – application of graphs for geographical data. | |
| | | Total | 30 |

Text Books and Reference Books:

1. Fundamentals of Cartography – R. P. Mishra and R. Ramesh, Concept Publishing Company, New Delhi 110 059.
2. Map work and practical geography, Lake Raj Singh and Raghunandan Singh, Century Book Depot, Allahabad.
3. Map work and practical geography, Gopal Singh, Vikas Publishing House Pvt. Ltd., Delhi.
4. Maps and diagrams – F. J. Monk House and Wilkinson Methuen & Company, London.
5. Getting to know Arc GIS by ESRI, Redland, U.S.A.
6. Field methods in remote sensing, Roger, M. McCoy, Rawat Publications, New Delhi.
7. Digital Image Processing, Pritvish N G and M Kudrat, Concept Publishing Company, New Delhi.
8. Anderson, J. M. and M. Mikhail, 1985, Introduction to Surveying, Network Mc. Gram Hill Book Co.
9. Burrough P. A., 1986, Principles of Geographical Information System for Land Resources Assessment, Clarendon Press, Oxford.

SGLGVC1352: Practicals based on SGLGVC1352

1. **Toposheet map reading**
2. Preparation of Base map
3. Preparation of thematic maps
4. Map scale and legends

SGLGOJ1351: Vocational Skill Course (VSC) Curriculum Details

SGLGOJ1351: Field Geology and Terrain Mapping Curriculum Details Semester VI

Course pre-requisite:

- The paper is designed in order to understand the component of fieldwork and techniques of field mapping, which are beneficial to students.

Course objectives:

- To provide basic knowledge of geological mapping and surveying techniques to the students.
- To upgrade and relate the theoretical knowledge of geological aspects to field observations.

Course outcomes:

- Student will be able understand how preliminary surveys are carried out, fundamental aspects of field geological techniques.
- The students would be trained to use different field equipments for geological mapping.

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

SGLGOJ1351: Field Geology and Terrain Mapping (Practical 4Cr.)

| Module No. | Unit No. | Topics | Hrs. Required to cover the contents |
|-------------------|-----------------|---|--|
| 1.0 | | Basics of geological fieldwork | |
| | 1.1 | Basics of geological field techniques | 16 |
| | 1.2 | Basics of geological field mapping | |
| | 1.3 | Introduction to geological field equipment and their uses | |
| | 1.4 | Safety in the field | |
| 2.0 | | Geological fieldwork | |
| | 2.1 | Recording of structural data during fieldwork | 14 |
| | 2.2 | Recording of petrological data during fieldwork | |
| | 2.3 | Recording of palaeontological data during fieldwork | |
| | 2.4 | Techniques of field photography | |
| 3.0 | | Geological fieldwork | |
| | 3.1 | Introduced to the different techniques of observation | 14 |
| | 3.2 | Sample collection and sampling methods | |
| | 3.3 | Measurements and recording field data in the notebook | |
| | 3.4 | Use of Clinometer and Brunton Compass. | |
| 4.0 | | Geological Mapping | |
| | 4.1 | Carryout fieldwork in diverse geological terrains of India. | 16 |
| | 4.2 | Preparation of geological map | |
| | 4.3 | Data Compilation. | |
| | 4.4 | Field Report Preparation | |
| | | Total | 60 |

Text Books and Reference Books:

1. A Guide to Field Geology - N. W. Gokhale, *CBS Publishers*
2. Basic Geological Mapping - J. W. Barnes and R.J. Lisle, *Wiley-Blackwell*
3. Field Geology - F. H. Lahee, *CBS Publishers*
4. Geological Field Techniques - Angela L. Coe, *Wiley-Blackwell*
5. Geology in the Field - R. R. Compton, *Earthspun Books*
6. Sedimentary Rocks in the Field - M. E. Tucker, *Wiley-Blackwell*
7. Sedimentary Rocks in the Field: A Colour Guide - D. A. V. Stow, *Manson Publishing*
8. The Field Description of Igneous Rocks - D. Jerram and N. Petford, *Wiley-Blackwell*
9. The Field Description of Metamorphic Rocks - N. Fry, *Wiley-Blackwell*
10. The Mapping of Geological Structures - K. R. McClay, *Wiley-Blackwell*

SGLGOJ1351: Practicals based on SGLGOJ1352

1. A detailed Field Report along with the geological map (prepared by the students) is to be submitted before the End Semester Examination and Viva-voce to be conducted
2. Geologically mapping of planar and linear structures using standard geological symbols
3. Rock specimens are to be collected from the field, identified and labelled.
4. Duration of the Fieldwork is to be of minimum 10 days
5. Preparation of Project Report and viva-voce