



**SKE SOCIETY'S  
GOVINDRAM SEKSARIA SCIENCE COLLEGE  
BELAGAVI  
(AUTONOMOUS)**

**THE COURSE STRUCTURE & SYLLABUS OF UNDER GRADUATE**

**BACHELOR OF SCIENCE**

**GEOLOGY**

**1<sup>ST</sup> AND 2<sup>ND</sup> Semesters**

**w.e.f.**

**Academic Year 2024-25 and Onwards**

Submitted by  
Chairman,  
Board of Studies,  
Bachelor of Science  
(Geology)

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**GOVINDRAM SEKSARIA SCIENCE COLLEGE, BELAGAVI**  
**(AUTONOMOUS)**

Accredited with 'A' Grade by NAAC in 4<sup>th</sup> Cycle

**FACULTY OF SCIENCE: DEPARTMENT OF GEOLOGY**

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**1. Board of Studies: Geology (UG)**

<b>Sl. No</b>	<b>Name and Designation</b>	<b>Position</b>
<b>01</b>	<b>Prof. Suraj Mense Head &amp; Lecturer, Department of Geology, GSS College, Belagavi, Karnataka</b>	<b>Chairperson</b>
<b>02</b>	<b>Dr. Raju Sukhaye Lecturer, Department of Geology, GSS College, Belagavi, Karnataka</b>	<b>Member</b>
<b>03</b>	<b>Prof. Yogesh Kutre Lecturer, Department of Geology, GSS College, Belagavi, Karnataka</b>	<b>Member</b>
<b>04</b>	<b>Dr. J T Gudagur Professor, Department of Geology, Karnatak Science College, Dharwad, Karnataka</b>	<b>Subject Expert</b>
<b>05</b>	<b>Dr. Sanjay V Pathare Associate Professor and head, Department of Geology, Rajaram College, Kolhapur, Maharashtra</b>	<b>Subject Expert</b>
<b>06</b>	<b>Dr. Aditya Udayraj Joshi Assistant Professor, Department of Civil Engineering, Manipal Institute of Technology, Manipal, Karnataka</b>	<b>University Nominee</b>
<b>07</b>	<b>Dr. P T Hanamgond Retd. Associate Professor &amp; Head, G.S.S. College, Belagavi, Karnataka</b>	<b>Member of the College Alumni</b>
<b>08</b>	<b>Mr. Sagar Waghmare Chief Geology Consultant, SP Consultancy Belagavi, Karnataka</b>	<b>Representative from Industry</b>

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**FACULTY OF SCIENCE: DEPARTMENT OF GEOLOGY**

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**COURSE STRUCTURE FOR B.Sc. PROGRAMME**

Semester	Subjects	Teaching Hours/week	Duration of Exams	Marks			Credits
				IA	Exam	Total	
1	Major1 Theory	04	03	20	80	100	04
	Major1 Practical	04	04	10	40	50	02
	Major2 Theory	04	03	20	80	100	04
	Major2 Practical	04	04	10	40	50	02
	Major3 Theory	04	03	20	80	100	04
	Major3 Practical	04	04	10	40	50	02
	Language1	04	03	20	80	100	04
	Language2	04	03	20	80	100	04
	Compulsory-1	02	02	10	40	50	02
2	Major1 Theory	04	03	20	80	100	04
	Major1 Practical	04	04	10	40	50	02
	Major2 Theory	04	03	20	80	100	04
	Major2 Practical	04	04	10	40	50	02
	Major3 Theory	04	03	20	80	100	04
	Major3 Practical	04	04	10	40	50	02
	Language1	04	03	20	80	100	04
	Language2	04	03	20	80	100	04
	Compulsory-2	02	02	10	40	50	02
<b>Total</b>							<b>56</b>

# **GOVINDRAM SEKSARIA SCIENCE COLLEGE, BELAGAVI (AUTONOMOUS)**

## **Department of Geology**

B.Sc. Semester wise Geology Course Scheme under  
State Education Policy (SEP) with effect from 2024-25 onwards

The Geology Department of SKE's Govindram Seksaria Science College (Autonomous), Belagavi seeks to provide the basic and fundamental concepts in Geology through our educational, research, and outreach programs, in order to produce well-trained, young geoscientists capable of responding to social needs.

### **Department's Mission**

- The Geology Department will develop in each student, art of imagination, critical thinking, and enthusiasm; build necessary skills to be a good geoscientist and to be the lifelong love of mother earth.
- To facilitate integrated and interdisciplinary approach in their learning.
- Develop a greater awareness of Earth Sciences in the general public through outreach programs.

### **Objectives**

The basic objective is to establish the Department of Geology of SKE's Govindram Seksaria Science College (Autonomous), Belagavi as the center for research in this part of the country and promoting the development of Geology.

The Geology department also strives to develop in each student the awareness towards sustainable use of natural resources such as- minerals, water and energy sources. Other important objectives are -

- To impart and inculcate the basic geological knowledge to students and prepare them to be a good geo scientist.
- To imbibe in them the love towards mother earth and care for the environment.
- To create awareness in them about the Earth's environment, critical issues and need for sustainable development.
- To produce well-trained, budding geoscientists capable of responding to societal needs.
- To achieve the knowledge and skills in Geology and to experience the multidisciplinary approach.
- To develop abilities of logical thinking and imagination; importance of field data collection, data analyzing, synthesizing and drawing fair conclusions.

## **Programme Outcomes of B.Sc. Geology**

On completion of the 03 years graduate of B.Sc. Geology programme in Geology students will be able to:

- Megascopically identify rocks, minerals and fossils in the field as well as laboratory.
- Read and interpret geological maps with particular reference to structure and lithology.
- Design and develop geological map, geological cross section and panel diagrams to understand subsurface geology.
- Interpret topographical maps.
- Identify landforms, soil types and their interrelationships.
- Carryout microscopic identification of rocks and minerals.
- Assist in site selections for civil engineering constructions.
- Plan and execute geological field work.
- Understand natural hazard and its impact on the society.
- Assess the environmental impacts in a geologic perspective.
- Develop geological knowledge so as to evolve sustainable living.

# RANI CHANNAMMA UNIVERSITY, BELAGAVI

## Department of Geology

B.Sc Semester wise Geology Course Scheme under  
State Education Policy (SEP) with Effect from 2024-25 onwards

### Note:

- a) **Student batch:** As this is a semi technical and at present available only at GSS College, each batch should consist of not more than 15 students for the regular practical classes.
- b) **Practical Record:** Submission of a well-maintained Journal of the Practical Work done during the semester is necessary before the Practical Examination.
- c) **Assignments:** The students will be given assignments, which are to be submitted before the 2<sup>nd</sup> Internal Test examination.
- d) **Geological Field Report:** As the geological features, structures, rock and mineral occurrence are better understood in the field, there will be a Geological Study Tour to the places of geological interest for 3- 10 days, mainly to study the field occurrence of geological features, rocks and minerals etc., during each semester, which carries weightage during semester end exam. Each student shall submit a consolidated study tour report along with the journal.

### NATURE OF THEORY AND PRACTICAL EXAMINATION

#### a) Theory Examination: (Total 100 Marks)

- i) There will be one theory paper of 80 marks in each semester.

Each paper will contain THREE Sections, which are to be written in the same answer book.

**PART A:** TWELVE Questions (Definitions/two sentence answers) numbered 1-12, each of 2 marks. Students need to answer ANY TEN questions. (2x10 = 20 Marks)

**PART B:** SIX Questions (Short answers) numbered as 13,14,15,16,17 & 18. Each of FIVE marks students need to answer ANY FOUR questions (4x5 = 20 Marks)

**PART C:** FIVE Questions (Descriptive answers) numbered 19,20,21,22 & 23. Each of TEN marks, students need to answer ANY FOUR questions (4x10 = 40 Marks)

- ii) **The remaining 20 marks** are allotted for Internal Assessment Marks – of 1 hour 15 minutes **for two internal tests** in theory.

- a. Two internal tests of 20 marks each reduced to 10 marks.
- b. Internal Assignment/Seminars/Student project work/Viva-voce (10 marks): Students are given assignments/seminars on the subject taught or a student project work.

#### b) Practical Examination: Total 50 Marks.

- a. Practical examination will have 3 or 4 Questions of **30 marks**.
- b. Practical Record (Journal), Field study tour report and Viva Voce carry **(10 marks)**.
- c. Practical Internal test: One internal test of 20 marks reduced to 10 **(10 marks)**.

**B. Sc. I Semester Geology Theory**  
**GEODSCT 1.1 Dynamic Geology, Geomorphology & Field**  
**Geology - (Credits -4)**

**Total 60 Lectures**

**Course outcome:** At the end of the course the student should be able to:

CO 1: Explain the origin and internal structure of the Earth.

CO 2: Explain the formation and origin of the volcano and earthquake.

CO 3: Learn the relevance of weathering and the features and processes related with wind and coastal line.

CO 4: Explain the features and processes related with river and glacier.

CO 5: Learn the handling of geological equipments along with the interpretation of field features.

UNIT	TOPICS	Lectures
	<b>A. DYNAMIC GEOLOGY</b>	
I	<b>Introduction:</b> Definition of Geology, branches of geology, role of geology in the development of mankind.	12
	<b>Origin of Universe and Age of Earth:</b> Universe, Big bang theory, solar system, Nebular– Planetesimal hypotheses; cooling and consolidation of earth. Age of Earth (organic evolution, sedimentation, salinity, rate of cooling & radioactive dating: Rb/Sr, U/Pb), Asteroids, Meteorites, Comets	
	<b>Interior of Earth:</b> Study of interior of earth using seismic waves (P, S waves): Crust, Mantle and Core. Discontinuities (Conrad, Mohorovicic, Repetti, Gutenberg and Lehman discontinuities).	
	<b>Isostasy:</b> Pratt's and Ary's hypotheses. Seafloor Spreading, Wegener's Theory of Continental Drift. Plate Tectonics: Tectonic Plates, Mid Oceanic Ridges, Convection currents, Plate movements, Constructive and Destructive plate boundaries(Divergent, Convergent and Transform), Features associated with Plate Boundaries: Continental arc, oceanic arc, hot spots, triple junction. Journey of Indian plate movement and origin of Himalayas.	
II	<b>Volcano:</b> Definition – typical volcano. Classification of volcanoes: active, dormant and extinct. Types of eruptions: fissure (Deccan Volcanic province) and central eruptions. Products of volcano: liquid (magma and lava), solid (cinder, lapilli, volcanic bombs, ash) and Gases. Effects of volcano.	12
	<b>Earthquake:</b> Definition – focus and epicenter. Seismic waves: surface waves (Love & Rayleigh) and body waves (P & S); Causes- tectonic: elastic rebound theory and non-tectonic (volcanic, landslides, explosions) and tectonic: elastic rebound theory; classification based on depth of epicenter; Magnitude and intensity: modified Mercali and Richter scale; seismograph and seismogram; seismic zones of India; effects of earth quake & tsunami; and prediction of earthquakes.	
	<b>B. GEOMORPHOLOGY</b>	
	Introduction: - Definition and scope, Basic concepts of Geomorphology, Geomorphic agents, <b>Epigene agents:</b> atmospheric- Temperature, gases, moisture, surface-subsurface water, sea water, wind and ice, <b>Hypogene agents:</b> Internal temperature (atomic and Magmatic). Geomorphic processes- exogeneous and endogeneous. <b>Weathering:</b> Definition, agents of weathering (Water, Wind, Ice, temperature and anthropogenic). Physical weathering: frost action (wedging and heaving); thermal weathering- spheroidal weathering and exfoliation, action of gravity - scree, talus, Chemical weathering: Water as a chemical agent. Oxidation, hydration and carbonation. Biological weathering: Action	

III	of plants, animals and man. landforms of weathering (Plateau, mesa, butte, hogback and queda). Soil - Definition, Formation, Types of soils. Soil Profile.	1 2
	<b>Wind:</b> Geological action of wind- erosion, transportation and deposition, Erosional action and features- deflation- winnowing action, oasis,playas. Abrasion- ventifact, pedestal rocks, yardang, pinnacles/ inselberg. Attrition- millet seed sand, Transportation- Suspension, saltation, traction/rolling. Depositional features: sand dunes- longitudinal,transverse dunes, star dunes, barchans and loess deposit.	
	<b>Coastal Processes:</b> Definition of Coast. Types of Coasts (rocky and sandy). Shoreline of Emergence & Submergence. Waves, currents and Tides. <b>Geological work of Sea</b> – Erosion, Transportation and Deposition. Coastal landforms - Island, Beach, Estuary, Bay, Cliffs, natural arc and stacks, blow hole (Geo) and wave cut platform. Longshore Bar, Spit, Barrier and Fore dunes.	
IV	<b>Geological action of River:</b> Definition, development of drainage system, erosion: hydraulic action- abrasion, attrition, corrosion; Transportation: solution, suspension, saltation and rolling. Stages of River: Youth stage - water fall, cascade, and river capture/piracy; vertical cutting, V-shape valley, canyon/gorge, pot hole; Mature stage- lateral cutting, meandering, oxbow lake, natural levee, flood plain, alluvial fan; and Old stage- base level of erosion, and formation of delta. River terraces.	12
	<b>Geological action of Glacier:</b> Definition, snow field, snow line, neve/fern. Movement of glaciers, types of glaciers – valley glacier, piedmont glacier, ice sheet. Surface features: Crevasses, types of crevasses – bergshrund, longitudinal, transverse and marginal. Erosion – abrasion, excavation/valley plucking, frost wedging and scraping; Erosional features- cirque/corrie, arête, horns,U-shape valley, hanging valley, roches moutonnee. Deposition – depositional features: moraines- lateral, medial, terminal/end, ground moraines, tillite, erratic/perched block. Glacio-fluvial deposits- Outwash plain, kettle hole, kames, drumlins, eskers.	
V	<b>C. FIELD GEOLOGY</b>	12
	<b>Geological Equipments:</b> Introduction to - Toposheet, Satellite Images, Geological maps, Hammer, Hand lens, Brunton Compass. Global Positioning System (Latitude, longitude and altitude), Drone. <b>Geological Field Report:</b> Aims and Objectives, Content of geological field report (Introduction, StudyArea, Accessibility, Climate, Geology of the area, Methodology, Results, Discussions Conclusion, Bibliography and Appendix).	

**B. Sc I Semester Geology Practical**  
**GEODSCP 1.A**

**Interpretation of Topo maps, Geomorphological Models &  
Morphometric analysis (Credit -2)**

**Max. Marks: 50**

**Time: 4 hrs/week**

**Total 56 Lectures**

1. Interpretation of topo maps: Reading of signs, symbols and color coding, scale, latitude-longitude, study of natural and manmade features (relief, drainage, vegetation, settlement, transportation and communication)
2. Preparation of Land Use/Land Cover maps:
3. Describe the following geomorphological models with neat sketches and labeling: Stages of river- Initial, Youth, Mature and Old stage; Typical Volcano; Karst topography; Glacial landforms; Coastal landforms, wind landforms, Plateau, mesa and butte.
4. Measurements of attitude of beds using Brunton compass. Application of Global Positioning System (GPS) and drone.
5. Calculation of earthquake epicenter using the given data.
6. Field visit to a place of geological/geomorphological interest.

**BOOKS RECOMMENDED**

- |                                       |                          |
|---------------------------------------|--------------------------|
| 1. Principles of Physical Geology     | A. Holmes                |
| 2. Geomorphology                      | V.K. Sharma              |
| 3. Aspects of tectonics               | K.S. Valdiya             |
| 4. Environmental Geology              | K.S. Valdiya             |
| 5. General Geology                    | Radhakrishanan. V        |
| 6. A text book of Geology             | Mahapatra, G.B           |
| 7. Text book of Geology               | P.K.Mukherjee            |
| 8. Text book of Geology               | A.K.Datta                |
| 9. Engineering Geology                | Parbin Singh             |
| 10. Principles of Engineering Geology | K.M.Bangar               |
| 11. Introduction to Geomorphology     | V.S. Kale & Avijit Gupta |
| 12. Field Geology                     | F.H.Lahee Marissova      |

**B. Sc II Semester Geology Theory**  
**GEODSCT 2.1 Mineralogy, Optical Mineralogy &**  
**Crystallography**  
**(Credits -4)**

**Total 60 Lectures**

**Course Objectives:** At the end of the course the student should be able to:

CO 1: To understand the identification of mineral using the physical properties.

CO 2: To acquire knowledge on different rock forming minerals.

CO 3: To understand the identification of minerals using the properties studied under the plane polarised light.

CO 4: To understand the identification of minerals using the properties studied under the crossed Nicols.

CO 5: To understand internal structure and classification of crystals into six systems along with introduction to analytical techniques like XRD and SEM.

UNIT	TOPIC	Hrs
	<b>A. MINERALOGY</b>	
<b>I</b>	Definition of rock and mineral. Rock forming minerals and ore forming minerals, Physical properties of mineral: <b>Properties depending upon light</b> - color, streak, diaphaneity and its types, luster and its types. <b>Properties depending upon state of aggregation</b> - Forms- columnar, lamellar and granular. <b>Imitative shapes</b> - reniform, botryoidal, mamillary, vesicular and amygdaloidal, dendritic, stalactitic and stalagmitic. <b>Properties depending upon cohesion and elasticity</b> – Cleavage and its types, Fracture and its types, Hardness (Moh’s scale of hardness) and Tenacity and its types; <b>Other properties</b> : Taste, Odor, Feel, Magnetism, Electricity. <b>Specific Gravity</b> – Walker Steel Yard Balance. <b>Forms</b> - Isomorphism, polymorphism, pseudomorphism	<b>12</b>
<b>II</b>	Silicate Mineral Structures. <b>General characters and uses of following group of minerals</b> : Quartz, Felspar, Mica, Pyroxene, Amphibole, Olivine & Garnet, Carbonates, Phosphates, Sulphides and zeolites.	<b>12</b>
	<b>B. OPTICAL MINERALOGY</b>	
<b>III</b>	<b>Nature of light</b> – Electromagnetic wave. Ordinary and polarized light – Reflection, refraction and refractive index, critical angle and total internal reflection. Double refraction. <b>Petrological microscope</b> : Introduction to parts of microscope. Preparation of thin section. <b>Polarization</b> : polarization by reflection, Brewster’s law - polarization by refraction, polarization by absorption.	<b>12</b>
<b>IV</b>	<b>Construction of Nicol Prism</b> – Behavior of light under in the microscope without mineral, with isotropic mineral and with anisotropic mineral. <b>Optical Accessories</b> : Mica plate, Gypsum Plate and Quartz Wedge. <b>Optical properties of mineral</b> : under plane polarised light- colour, pleochroism, form, cleavage, fracture, relief. <b>Properties under analysed light/crossed nicols</b> - Isotropism and anisotropism; Interference Colours; Birefringence; Extinction - types, extinction angle; Zoning and Twinning.	<b>12</b>
	<b>C. CRYSTALLOGRAPHY</b>	
<b>V</b>	Definition of crystal, Crystal morphology and internal structures, unit cell and its types. Crystallographic axes, crystal zones and habits. Euler’s law. Interfacial angle, Contact Goniometer and its use, Crystal symmetry, Crystal parameters, indices and classification of crystals into six holohedral class of forms. Introduction to analytical techniques like XRD (X-ray diffraction), SEM (Scanning electron microscopy).	<b>12</b>

## B. Sc II Semester Geology Practical

### GEODSCP 2.1 MINERALOGY, OPTICAL MINERALOGY & CRYSTALLOGRAPHY (Credit -2)

Max. Marks: 50

Time: 4 hrs/week

Total 56 lectures

1. **Mineralogy:** Study of general characters and uses of following minerals.  
**Silica group-** Rock Crystal, Amethyst, Chalcedony, Agate, Flint, Jasper, Opal. **Felspars group-** Orthoclase, Microcline, Plagioclase; **Zeolites group -** Natrolite, Stilbite, appophillite, **Mica group -** Biotite, Muscovite, **Pyroxene group -** Hypersthene, Augite, Diopside; **Amphibole group -** Hornblende, **Olivine group,** **Garnet group;** Calcite, Dolomite, Alumino Silicate group- Kyanite, sillimanite, andalusite. Corundum, Beryl, Tourmaline, Talc, Gypsum, Serpentine, Asbestos & Barites. Ore minerals: Hematite, Pyrrulosite, Chalcopyrite, Bauxite, Magnesite
2. Determination of specific gravity by Walker steel yard balance.
3. **Optical Mineralogy:** Optical properties (under plane polarized and analysed light) of following minerals- Quartz, Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Hypersthene, Augite, Hornblende, Olivine, Kyanite, Calcite, Garnet.
4. Determination of Extinction and Cleavage angle under microscope.
5. **Crystallography:** Forms of a crystal: face, edge, solid angle, Euler's law, Interfacial angle with the help of Contact Goniometer. Study of elements of symmetry and forms of crystal models of normal class: Isometric/Cubic, Tetragonal, Orthorhombic, Hexagonal, Monoclinic, Triclinic systems.
6. Field visit to study the mode of occurrence of rocks and minerals.

#### BOOKS RECOMMENDED

- |                                        |                |
|----------------------------------------|----------------|
| 1. Rutley's Elements of Mineralogy     | H.H. Read      |
| 2. Optical Mineralogy                  | Kerr.P.F       |
| 3. Optical Mineralogy                  | Winchel        |
| 4. Mineralogy for students             | M.I. Batty     |
| 5. Mineralogy                          | Berry & Mason  |
| 6. Dana's Text book of Mineralogy      | W.E. Ford      |
| 7. Optical Mineralogy                  | E.E. Wahlstrom |
| 8. Elements of Optical Mineralogy      | A.N. Winchell  |
| 9. Engineering Geology                 | Parbin Singh   |
| 10. Principles of Engineering Geology  | K.M.Bangar     |
| 11. Treatise of Minerals of India      | R.K.Sinha      |
| 12. An introduction to crystallography | Phillips, P    |

## B. Sc I Semester Geology Certificate Course Fundamentals of Remote Sensing and GIS

**Lectures: 15 Hrs Theory (2 Hours per week)**

**Practicals: Two (4X2=8 Hours)**

### Course Outcome:

1. Students will be able to understand fundamentals of photogrammetry.
2. Student will be able to delineate associated features and interpret the landforms and other features.
3. Student will be able to use these techniques during field work, research such as water management analysis.
4. Student will be able to determine land use and land cover in various fields such as disaster management.
5. This course will provide platform to start the journey and excel in further understanding of remote sensing and GIS techniques.

### Course pattern:

Certificate course will be focused on 17 hours of practical with hands on training and 14 hours of theory. Student has to pass a written test and submit assignment at the end of the course. Student will be awarded a certificate after completion of course.

### SYLLABUS

Units	Topics	Hours
<b>THEORY: 14 HOURS</b>		
1.	Remote Sensing - Definition and terminology. Types of satellites on the basis of their work. Indian satellites (IRS and INSAT). Application of remote sensing and its significance in Geology, Disaster Management, Elements of image interpretation and keys	2
2.	Electromagnetic spectrum. Visible spectrum, infrared, near infra-red, microwave. Band combinations MSS and FCC's.	2
3.	Elements of map, types of map, aerial photos: Types of scale, Latitude-Longitude and other information.	2
4.	Aerial photography - Definition and terminologies: Swath, Overlap, Mosaic, Parts of Aerial photographs	2
5.	Brief introduction to endogenic and exogenic process, types of landforms developed by wind, water and Glacier.	2
6.	Drainage patterns their types and significance in water management.	2
7.	Global Positioning System (GPS) basic principles and its field application.	2
<b>PRACTICALS – 17 hours</b>		
1.	Exercise 1: Depth perception exercises	2
2.	Exercise 2: Stereo test and determination of scale	2
3.	Exercise 3: Identification of features on single vertical aerial photograph.	2
4.	Exercise 4: Interpretation of cultural details and preparation of land use map using satellite image.	2
5.	Exercise 5: Study of RADAR and SAR (Microwave) imagery and interpretation of features.	3
6.	Exercise 6: familiarization with Q-GIS for Digital Image Processing	3
7.	Exercise 7: GPS and GPS Essential app	3