Subject (Geology) BSc.	***After completion of the course the student will be able to :***
Programme Outcomes	PO1: Analyze geological data and interpret the results to understand Earth's processes and history. PO2: Apply geological principles and methodologies to solve complex geological problems in field and laboratory settings. PO3: Evaluate the impact of geological phenomena on the environment and society, integrating sustainability considerations. PO4: Create geological maps and cross-sections to represent spatial relationships and geological structures effectively. PO5: Demonstrate proficiency in using geological tools and technologies for data collection and analysis. PO6: Compare different geological theories and models to explain Earth's processes and phenomena. PO7: Develop research proposals based on current geological challenges and conduct independent investigations. PO8: Synthesize information from various geological sources to draw comprehensive conclusions about geological issues. PO9: Communicate geological findings clearly and effectively through written reports, presentations, and scientific papers. PO10: Critique geological literature and research to identify gaps in knowledge and suggest areas for further study.
Programme Specific Outcomes	PSO1: Analyze geological field data to identify and characterize mineral deposits, rock formations, and structural features in various geological settings. PSO2: Apply advanced geophysical and geochemical techniques to investigate subsurface conditions and assess natural resource potential. PSO3: Evaluate the geological hazards and risks associated with natural events such as earthquakes, landslides, and volcanic eruptions, and propose mitigation strategies. PSO4: Design and conduct geological surveys and experiments to gather evidence for research projects and practical applications in environmental and resource management. PSO5: Interpret geological maps, cross-sections, and remote sensing data to assess geological features and inform decision-making in land use and environmental planning.
Course Outcomes	
Semester 1	

Core-1 (General Geology And Quaternary Geology)	CO1: Describe the fundamental characteristics and origin of the Universe, Solar System, and the Earth, including its size, shape, mass, density, and the parameters of its rotation and revolution. CO2: Analyze the internal structure of the Earth, including the formation of the core, mantle, and crust, and explain the processes of convection, radioactivity, and their impact on Earth's magnetic field and age. CO3: Evaluate the various types of volcanoes and earthquakes, including their causes, intensity, distribution, and impact on the Earth's surface and environment. CO4: Explain the processes of weathering, erosion, and mass wasting, and assess the geological work of rivers, glaciers, wind, underground water, and oceans in shaping landforms. CO5: Investigate Quaternary geological phenomena such as climate change, eustatic movements, and glaciation, and interpret their effects on landforms and deposits, with a specific focus on India.
Core-2 (Tectonics And Remote Sensing)	CO1: Explain the processes of epeirogeny and orogeny related to tectonic movements. CO2: Analyze the concept of isostasy and evaluate its significance in geological processes. Compare and contrast different theories of mountain building. Describe the origin of oceans, continents, mountains, and rift valleys based on geological evidence. CO3: Define plate tectonics and classify types of plate margins. Evaluate the evidence and causes of continental drift. Describe the process of sea-floor spreading and its implications. Analyze features such as mid-oceanic ridges, trenches, and transform faults in plate tectonics. Explain the formation and characteristics of island arcs. CO4: Apply principles of aerial photography to Analyze. Apply digital image processing techniques to enhance geological data from remote sensing. CO5: Describe the relief features of the ocean floor and their formation processes. Classify marine sediments based on their characteristics and origin. Evaluate the significance of aquatic resources in geological and environmental contexts. Analyze the formation and characteristics of submarine canyons, seamounts, and guyots. Explain the formation and ecological importance of coral reefs.
Semester 2	
Core-3 (Crystallography and Mineralogy)	CO1: Define crystallography and differentiate between various crystal systems based on their symmetry and atomic arrangements, Apply crystallographic principles to analyze

	and predict the geometric shapes and symmetry of crystals from different mineral groups. CO2: Evaluate the physical properties of minerals, including hardness, cleavage, and specific gravity, based on their crystal structures. CO3: Describe the chemical composition of minerals and classify them according to their chemical formulas and structural groups. CO4: Classify silicate minerals based on the arrangement of silica tetrahedra in their crystal structures and analyze their geological significance. Compare and contrast the physical and chemical properties of different silicate mineral groups, such as feldspars, quartz, and micas.
Core-4 (Optics and Geochemistry)	CO1: Explain the nature of light, including its wave and particle properties, and analyze its interaction with minerals. CO2: Apply principles of mineral optics to interpret the optical properties of minerals, including pleochroism, birefringence, and extinction angles. CO3: Analyze the concept of geochemistry and its role in understanding the distribution and behavior of elements in Earth's systems. CO4: Evaluate the cosmic abundance of elements and compare their distribution in the universe and within planetary bodies Classify elements based on their cosmic abundance and geological importance, and evaluate their roles in planetary evolution and Earth's composition CO5: Explain the concept of atomic substitution in minerals and analyze its implications for mineralogical properties and geochemical processes.
Semester 3	
Core-5 (Igneous petrology	CO1: Define the fundamental concepts of igneous petrology, including magma genesis, crystallization processes, and classification schemes. CO2: Differentiate between the various forms of igneous rocks (intrusive and extrusive) based on their textures, structures, and geological settings. CO3: Interpret the origin and geological significance of different types of igneous rocks based on their mineral assemblages, textures, and geochemical compositions. CO4:Classify igneous rocks, and discuss their petrogenetic implications.
Core-6 (Sedimentary petrology)	CO1: Explain the processes and mechanisms involved in the origin of sediments, including weathering, erosion, transportation, and deposition.

	CO2: Analyze sedimentary textures such as grain size, sorting, rounding, and sedimentary structures like bedding, cross-bedding, and ripple marks, to interpret depositional environments. CO3: Evaluate the environmental conditions and depositional settings (e.g., fluvial, marine, aeolian) based on sedimentary textures, structures, and fossil content. CO4: Describe the methods and techniques used in sedimentary provenance analysis to determine the source areas of sediments, including mineralogy, geochemistry, and isotopic signatures. CO5: Describe the petrography of different sedimentary rocks based on their mineralogical, and textural criteria.
Core-7 (Metamorphic petrology)	CO1: Define the controls of metamorphism and classify different types (e.g., regional, contact, dynamic) based on their geological settings and processes. CO2: Differentiate between metamorphic facies and grades, categorizing them according to mineral assemblages, pressure-temperature conditions, and metamorphic reactions. CO3: Analyze the relationship between metamorphism and tectonism, examining how plate tectonics and crustal movements influence metamorphic processes and rock transformations. CO4: Classify metamorphic rocks based on their metamorphic grade (low-grade to high-grade) and facies (e.g., greenschist, amphibolite, granulite) and discuss their petrogenetic implications. CO5: Synthesize knowledge of metamorphic controls, types, facies, grades, and petrography to interpret metamorphic histories and their implications for geological evolution and resource formation.
Semester-4	
Core-8 (Palaeontology	CO1: Define the controls of metamorphism and classify different types (e.g., regional, contact, dynamic) based on their geological settings and processes. Analyze the fossil record to interpret the evolutionary history and biodiversity of life forms through geological time. CO2: Classify and identify major groups of invertebrate fossils based on their taxonomy, morphology, and stratigraphic distribution. Compare and contrast the evolutionary trends and adaptations observed in different classes of invertebrate fossils, such as molluscs, arthropods, and echinoderms. CO3: Describe the principles and methods used in vertebrate palaeontology to study fossilized remains of vertebrates, including dinosaurs, mammals, and early humans. Analyze vertebrate fossils to interpret their paleobiology, evolutionary

	relationships, and paleoecological interactions. CO4: Classify and identify fossilized plant remains based on their morphological characteristics and ecological significance. Evaluate the role of paleobotany in reconstructing ancient environments, climate change, and plant evolution throughout Earth's history.
Core-9 (Stratigraphy)	CO1: Explain the fundamental principles of stratigraphy, including the laws of superposition, original horizontality, and cross-cutting relationships. (Understand). Apply the code of stratigraphic nomenclature to classify and name rock units based on stratigraphic principles and hierarchical classification systems. CO2: Analyze Precambrian stratigraphy, categorizing and correlating geological formations and events to reconstruct Earth's early geological history. CO3: Compare and contrast the stratigraphy of the Paleozoic Era in India, including the identification of key formations, fossils, and depositional environments. CO4: Evaluate the stratigraphy of the Mesozoic Era in India, examining major geological events, stratigraphic sequences, and tectonic influences. CO5: Analyze the stratigraphy of the Cenozoic Era in India, interpreting sedimentary records, paleoclimate indicators, and evolutionary trends of flora and fauna.
Core-10 (Structural Geology)	CO1: Explain the processes and mechanisms of rock deformation under various geological conditions, including stress, strain, and deformation mechanisms along with classify different types of rock deformation structures such as folds, faults, joints, unconformities, foliations, and lineations based on their geometrical characteristics and geological settings. CO2: Analyze the formation and classification of folds in rocks, interpreting their geometry, axial planes, and hinge lines to reconstruct deformation histories. CO3: Evaluate the characteristics and classification of faults, including types (normal, reverse, strike-slip), fault planes, and fault zones, to interpret tectonic processes and stress regimes. CO4: Describe the formation and significance of joints in rocks, analyzing their spatial distribution, orientation, and effects on rock mass properties. (Describe) CO5: Interpret unconformities in stratigraphic sequences, including types (angular unconformity, nonconformity, disconformity), to reconstruct geological histories and depositional hiatuses. (Interpret) CO6: Analyze the development of foliation and lineation in metamorphic rocks, interpreting their orientations, mineral

	alignments, and structural implications. (Analyze)
Semester-5	
Core-11 (Processes of formation and Mineral economics)	CO1: Explain the magmatic processes involved in the formation of ore deposits, including fractional crystallization, magma differentiation, and mineralization mechanisms. CO2: Analyze the hydrothermal processes responsible for the formation of hydrothermal ore deposits, including fluid-rock interactions, deposition mechanisms, and mineral assemblages. CO3: Evaluate secondary processes of ore formation, such as weathering, erosion, transportation, and sedimentary deposition, and their role in forming secondary ore deposits. CO4: Analyze the distribution and geological significance of energy resources, including fossil fuels (coal, oil, natural gas) and renewable energy sources (solar, wind, hydroelectric), in relation to geological processes and economic considerations. *CO5:* Analyze the global distribution of mineral resources and energy reserves, resource depletion, and sustainability issues.
CC-12 (Economic Geology)	CO1: Define ores and gangues, classify them based on mineralogy and economic significance, and explain their geological occurrence. CO2: Classify metallic minerals according to their chemical composition, physical properties, and industrial uses. CO3: Identify industrial minerals and evaluate their geological occurrences, economic importance, and applications in various industries. CO4: Describe mineral exploration methods and techniques, including geological mapping, geophysical surveys, remote sensing, and geochemical sampling. (Describe) CO5: Distribution of different metallic and non-metallic minerals in India and their uses.
DSE-1 (Fuel Geology)	CO1: Describe the formation, types, and classification of coal, including its geological origins and stages of coalification. CO2: Explain the properties and uses of coal as a fuel, including its combustion characteristics, energy content, and environmental impact. CO3: Analyze the processes of coal formation and its conversion into energy, including the impact of different coal types on combustion efficiency and emissions. CO4: Explain the formation, composition, and types of petroleum, including the processes of hydrocarbon generation, migration, and accumulation. CO5: Analyze the characteristics of petroleum reservoirs, including their geological settings, porosity, permeability, and fluid

	properties. CO6: Describe the different types of petroleum traps (e.g., structural, stratigraphic) and their roles in the accumulation and extraction of hydrocarbons. (Describe) CO7: Compare the extraction and processing techniques for coal and petroleum, considering factors such as resource efficiency, environmental impact, and technological advancements. (Compare)
DSE-2 (Climate Change And Disaster Management)	CO1: Explain the types of natural disasters (e.g., earthquakes, hurricanes, floods, volcanic eruptions) and their impacts on human societies and ecosystems. CO2: Analyze strategies and methods for managing natural disasters, including preparedness, response, recovery, and mitigation measures. CO3: Describe the fundamental elements of climatology, including temperature, precipitation, humidity, and atmospheric pressure, and their role in climate systems. CO4: Analyze the world weather circulation patterns, including the roles of trade winds, westerlies, polar easterlies, and major atmospheric pressure systems, in shaping global weather. CO5: Explain the mechanisms of climate change, including natural and anthropogenic factors, greenhouse gases, and feedback loops, and their impacts on global climate systems. CO6: Evaluate the evidence for climate change, including temperature records, ice core data, and climate models, to assess trends and predict future climate scenarios. CO7: Compare the climate change impacts on different regions, considering factors such as temperature changes, sea level rise, and extreme weather events. (Compare)
Semester-6	
Core-13 (Groundwater and Engineering Geology)	CO1: Explain the water-bearing characteristics of geological formations, including concepts such as aquifers, aquicludes, and permeability. CO2:Analyze methods for groundwater exploration, including geophysical surveys, drilling techniques, and hydrogeological assessments, to evaluate groundwater availability and quality. CO3:Evaluate groundwater quality parameters, such as chemical composition, contamination levels, and suitability for various uses, to ensure safe and sustainable water resources. CO4: Describe the engineering properties of construction materials, including strength, durability, and thermal conductivity, and their implications for building design and stability. CO5: Analyze the geological considerations in the design and construction of dams, including rock mechanics, fault zones,

	and the impact of geological conditions on dam stability, tunnel and bridge construction and safety. CO6: Explain the principles of designing earthquake-resistant structures, including seismic load analysis, material selection, and structural reinforcement techniques. CO7: Apply knowledge of soil properties, such as compaction, shear strength, and settlement, to assess soil suitability for construction and foundation design.
Core-14 (Mining and Environmental geology)	CO1: Describe the fundamental principles and techniques of mining, including extraction methods, processing, and the role of geology in resource identification. CO2: Analyze the impacts of mining activities on the environment, including soil, water, and air quality, and assess methods for mitigating these effects. CO3: Evaluate disaster management strategies, including risk assessment, preparedness, response, recovery, and mitigation measures, to effectively handle natural and anthropogenic disasters. CO4: Explain the principles of resource management, including sustainable practices, resource conservation, and the balance between economic development and environmental protection. CO5: Describe the key concepts of environmental geology, including the interactions between geological processes and human activities, and their effects on ecosystems and communities.
DSE- 3 (Earth And Climate)	CO1: Explain the components and dynamics of the climate system, including the roles of the atmosphere, hydrosphere, lithosphere, and biosphere in regulating climate. CO2: Analyze the Earth's heat budget, including the processes of solar radiation absorption, heat distribution, and energy balance between incoming and outgoing radiation. CO3: Evaluate the mechanisms and impacts of monsoons on regional and global climate, including seasonal wind patterns, precipitation, and their effects on weather and agriculture. CO4: Describe the interactions between the atmosphere and hydrosphere, including processes such as evaporation, condensation, and precipitation, and their roles in the water cycle. CO5: Analyze the evidence and climatic changes associated with glacial periods, including glacial advance and retreat, ice core data, and impacts on global sea levels and climate patterns.
DSE–4 (Project)	**Project**