B.SC(HONS.) GEOLOGY

Paper No	Paper Name
1	**EARTH SCIENCE SYSTEM**
	After completion of this course students will be able to understand and comprehend the connectivity and dynamics of atmosphere, lithosphere, and hydrosphere of the Earth. A thorough understanding of Geology, its various branches and overall scope of Earth Science will be possible through this course.
2	**MINERAL SCIENCE**
	To develop an understanding of minerals as pure and impure phases Minerals as the building block of earth and planetary mass Basic understanding of crystallography and crystal chemistry 1) Identify common rock-forming minerals in hand specimen and in thin section using diagnostic physical, optical, and chemical properties Learning about crystallography and to infer the environment of formation of minerals Minerals as a tool to understand Earth processes, Earth's Interior and Earth history
3	**SEDIMENTARY PETROLOGY**
	Sedimentary rocks host all fossil fuels (coal, oil and gas), which is the driving force of modern civilization. Understanding basic processes of sedimentation (physical and chemical) including behaviour of fluids, fluid-grain interaction, structures formed thereof and processes control chemical sedimentation viz. carbonates, BIF, Phosphorite etc. is the goal of this course. The course will also aim for exposing students to different kinds of sedimentary rocks, their structures, textures and variability. Attempt will be made to provide students a holistic understanding of sedimentation process from deposition to diagenesis.
4	**STRUCTURAL GEOLOGY**
	To have an understanding of the geometry of deformation of earth material To identify these features in natural occurrence To measure attributes of such features and to relate these to regional deformational context. Structural geology essentially deals with the geometry, kinematics and dynamics of deformation of rocks. In response to the instability of the lithosphere produced by complex plate tectonic movements, continuous and discontinuous deformation takes place within the rocks in solid or semi-solid state, at different scales and at different depths, which manifests in a variety of complex structures in these rocks. The undergraduate CBCS course of structural geology will teach the students the different geometric features of deformation, different types of deformation-induced structures, basic techniques of measurement of different parameters in deformed rocks, and will also give them a glimpse of the underlying deformation processes and mechanisms.
5	**ELEMENTS OF GEOCHEMISTRY**
	By attending this course student will be able To understand evolution of the early Earth from proto-planetary material and its differentiation to present day state. To describe the composition of the Earth´s main geochemical reservoirs. To understand how chemical weathering of minerals and rocks control the composition of sediments/soil and natural water.
6	**IGNEOUS PETROLOGY**
	On completion of the course, the student should be able to: a) Determine the evolution of igneous rocks using petrographical, mineralogical and geochemical indices b) Describe magmatic rocks from a plate tectonic point of view.
7	**STRATIGRAPHIC PRINCIPLES AND INDIAN STRATIGRAPHY**
	Comprehensive understanding of fundamentals of stratigraphic principles and various methods of stratigraphic analysis will be provided. The stratigraphic classification from craton, mobile belt, Proterozoic to Phanerozoic succession from India is the goal of this course. Time concept in stratigraphic and major stratigraphic boundaries and their causative factors will be discussed in detail. Geological factors controlling the hydrocarbon accumulation and their future prospective will be discussed.
8	**METAMORPHIC PETROLOGY**
	1. Understanding nature of metamorphic rocks in contrast to igneous and sedimentary rocks 2. Applying phase rule as a basic tools in study of these rocks and through learning control of bulk composition on assemblage development 3. Identifying equilibrium mineral assemblages through textural and mineralogical observations 4. Plotting the quantitative as well as qualitative mineral and mineral assemblage data to interpret the discontinuous reactions and to infer the nature of continuous reactions 5. Relate and understand mineral assemblages and texture for tectonic and geodynamic interpretations especially in mountain building.
9	**PALAEONTOLOGY**

Paper No	Paper Name
	On successful completion of the course, the student will be able to: Appreciate how fossils get preserved in rocks, the nature of fossil record and how fossils are named in a taxonomic framework Get to know different invertebrate fossil groups, their palaeobiology, and how they can be used in relative dating of rocks. Learn how vertebrates originated and their evolution through time. Understand important floral changes over time and the flora of the Indian coal-bearing sedimentary basins. Analyse the indirect evidences preserved in the rocks for the past existence of life. Critically analyse the role of fossils in relative dating of rocks, in interpreting past environments, past distribution of land and sea, and changes in ecosystems over time.
10	**GEOMORPHOLOGY**
	In this course a student will learn about 1) the advantages to study geomorphology, 2) fundamentals of working of earth surface processes, and 3) various geomorphic techniques, 4) geomorphology of India, and 5) extra-terrestrial landforms.
11	**ECONOMIC GEOLOGY**
	Demonstration of field occurrence of mineral deposits- over ground as well as underground. Identification and recording of evidence of mineralization such as alteration zones etc. Learning the role of geology in mining of the mineral deposits.
12	**REMOTE SENSING AND GIS**
	In this course a student will learn about 1) the basic concepts of remote sensing, 2) Basic concepts of Photogeology and Photogrammetry, 3) the basic concepts of GIS, 4) GIS softwares viz., QGIS, Basic concepts and functioning of Global Positioning System (GPS).
13	**ENGINEERING GEOLOGY**
	1. Significance of geology in major engineering projects 2. Method of assessing geological perspective of major infrastructure projects 3. Rock properties related to the strength and bearing capacities of rocks and soils 4. Learning major techniques for ameliorating engineering properties of earth material 5. Understanding the effect and relationship of natural hazards on engineering projects
14	**HYDROGEOLOGY**
	The course will introduce students to the fundamental concepts of hydrogeology. They will learn about occurrence and movement of groundwater, aquifers and their parameters, groundwater exploration methods, aspects of groundwater chemistry and groundwater management.
15	**EXPLORATION GEOLOGY**
	1. Understanding of industrial and non-industrial resources and distinction between reserve and resource 2. Natural resource consumption patterns through historical times 3. Principles of prospecting of exploration 3. Techniques of mineral exploration 4. Reserve estimation methods
16	**EARTH AND CLIMATE**
	Climate system: Forcing and Responses Components of the climate system Climate forcing, Climate controlling factors Climate system response, response rates and interactions within the climate system Feedbacks in climate system Heat budget of Earth Atmosphere - Hydrosphere Response of biosphere to Earth’s climate Climate Change: natural vs. anthropogenic effects Orbital cyclicity and climate
17	**FUEL GEOLOGY**
	Types of conventional and non-conventional fuels and consumption trends through time 2. Coal- origin, types and resources 3. Petroleum- origin, traps, occurrence in specific geological domains 4. Non-conventional hydrocarbons **5.** Nuclear fuels
18	**URBAN GEOLOGY**

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	Urban geology draws on the all branches of the earth sciences, from stratigraphy to geochemistry and hydrogeology to geophysical exploration techniques; and it often makes linkages to the biological and environmental sciences. 1. Linking geology to the infrastructure developments 2. Linking geology to upkeep and optimization of natural resources like water and soil 3. Identifying possible domains of natural hazard in the context of town planning
19	**EVOLUTION OF LIFE THROUGH TIME**
	Students will be able: To understand how life originated and evolved through time. To learn how fossilization processes operate in nature. To interpret how organisms had responded to changes in environment and climate in the geological past. To learn about major mass extinction events in the Phanerozoic history of life
20	**RIVER SCIENCE**
	1. Rivers through geological time 2. Fluvial degradational and aggradational processes 3. Landforms associated with the rivers
21	**INTRODUCTION TO GEOPHYSICS**
	1. Physical properties of the natural material 2. Earth's interior through indirect methods 3. Geophysical exploration methods
22	**BASIC FIELD TRAINING**
	1. teaching attitudes of linear and planar structures 2. Introduction to front and back bearing and marking location on map 3. Map reading
23	**GEOLOGICAL MAPPING**
	1. Accurate location matching on ground and map 2. Accurate measurements of geological features 3. Preparation of thematic maps
24	**ECONOMIC GEOLOGY (FIELD)**
	1. Demonstration of field occurrence of mineral deposits- over ground as well as Underground 2. Identification and recording of evidence of mineralization such as alteration zones etc. 3. Learning the role of geology in mining of the mineral deposits
25	**HIMALAYAN GEOLOGY (FIELD)**
	1. To recognize imprints of major tectonic processes in orogens 2. To relate the structural and lithological elements to the structural level of an orogenic mountain 3. To identify longitudinal boundaries of the Himalayas and to distinguish the transverse elements
26	**PRECAMBRIAN GEOLOGY (FIELD)**
	1. To distinguish elements of mobile belts or older orogens in areas of low relief 2. To understand basic elements of a stabilized cratons 3. To understand role of extensional tectonics in such regions and 4. To observe features of intracratonic sedimentary basins
27	**VISIT TO ENGINEERING PROJECT SITE**
	1. Site selection parameters for major infrastructure projects such as dams, tunnels, roads, railways and power projects 2. Foundation mapping 3. Reservoir mapping 4. Treatment methods for weak material
28	**STRATIGRAPHY AND PALAEONTOLOGY (FIELD)**
	1. Application of the Principle of Uniformitarianism in field 2. Basement cover relationships - identifications and interpretations 3. Establishing order of superposition of geological units especially with the help of fossils
29	**ESSENTIALS OF GEOLOGY**

Paper No	Paper Name
	1. Earth, its origin and concept of geological time 2. Formation of planets and solar system 3. Composition of inner as well as surficial components of planet earth 4. Major geomorphic features, and compositions of various parts of earth and major earth processes
30	**ROCKS AND MINERALS**
	1. Students will be acquainted with different types of rocks and minerals 2. Students will come to know veracity of geological processes and formation of different rock types. 3. Students will know structure of the Earth and distribution of rocks
31	**PHYSICS AND CHEMISTRY OF EARTH**
	1. Students will come to know the dynamism in Earth processes 2. Students will be provided an idea about nucleosynthesis and elemental distribution in the Earth 3. Students will be appraised of concepts of Earth's magnetism 4. An idea of chemical character of the Earth
32	**EARTH RESOURCES AND ECONOMICS**
	1. Distinction between resource and reserves. Introduction to natural processes leading to earth resources 2. Energy- main conventional resources and their distribution 3. Energy- economic implications of asymmetric distribution of natural resources 4. Mineral conservation- principles and techniques
33	**NATURAL HAZARDS AND DISASTER MANAGEMENT**
	1. Definition and types of natural disasters 2. Geological basis of water related disasters such as floods etc.; 3. Landslide hazard mapping techniques 4. Earthquakes and seismic hazards 5. Forecasting and management of natural hazards
34	**EARTH SURFACE PROCESSES**
	In this course a student will develop holistic understanding of how earth surface processes work and interact with each other. They will learn about the tools and techniques to measure and interpret rates of earth surface processes. They will also learn the applied aspects of the earth surface processes investigation.
35	**FOSSILS AND THEIR APPLICATIONS**
	Student will learn about different types of life forms that existed in the geological past. Will learn about the evolutionary rates of certain important fossil groups and their role in dividing the rocks into distinctive units based on their stratigraphic ranges. Learn how fossils can be used in understanding the past environments, ecosystems, climate and distribution of land and sea. Will also learn about role of fossils in the exploration of hydrocarbons.
36	**INTRODUCTION TO SUSTAINABILITY**
	A student will learn about the concept of sustainability. They will also learn about the challenges faced by present and future generations regarding natural resources. They will also learn about the measures that can be taken to meet the challenges.
37	**GROUND WATER MANAGEMENT AND WATER QUALITY**
	The course will impart basic understanding about: groundwater science; aquifers; groundwater flow and groundwater management principles and practices. The concepts of water quality; water quality parameters and criteria for portable and irrigation use; contamination and pollution and graphical representation of the water quality data.
38	**HISTORY OF THE EARTH**
	By completeing this course the students will be well versed with the pattern of changes occuring in various spheres of earth through geological time from Barysphere to mesosphere, lithosphere, cryosphere, atmosphere, biosphere etc. A comprehensive understanding of all these sphere through geological time will enable the student to understand future of our planet.
39	**PLANETARY GEOLOGY**
	1. Origin of planets 2. Planetary features including those of the exoplanets 3. Remote sensing techniques in planetary characterization 4. Impact cratering- rates and causes 5. Planetary surface processes and interiors
40	**SOILS: PAST AND PRESENT**
	1. Students will have idea on soil forming processes 2. Students will come to know recognizing criteria of palaeosol 3. Students will have idea on geological record of fossil soils

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41	**GEOTOURISM**
	1. Distinguishing and identifying potential geological sites of tourist interest 2. Spectacular (e.g. geomorphic landforms, structures) as well as intrinsic sites (major time boundaries, fossil sites, LIP's, transgressions regressions etc) 3. Economic aspects and linking geospots with other tourist destinations in a theme