Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani-431401

Pro-forma for program and course outcomes (2.6.1)

Department: Geology

Program: B.Sc. F.Y. **Subject**: **Geology** **Course Code**: **CCG-I**

Name of Teacher: Dr. R. B. Muley And Dr. Md .Babar

Paper Title: - Earth as a planet and Dynamic Geology - Paper No. I
-Mineralogy, Crystallography- Paper No. II
-Physical Geology and Palaeontology Paper No. III
-Petrology Paper No. IV

Unit Number	Unit Name	Topics	Unit-wise Outcome
Semester –I Paper No. I	UNIT I **Earth as a planet**	**Earth as a planet** Geology and its Perspective. Earth in the solar system: Origin, Size, Shape, Mass, density rotational and revolution of the earth. Relief features of the earth surface and interior of earth as core, mantle, and crust. Introduction to hydrosphere, lithosphere, atmosphere and biosphere and elemental abundance in each constituent. Age of the Earth	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..
	UNIT II **Dynamic Geology**	**Dynamic Geology** Introduction, causes, types & effects of Earthquake, Volcanoes and their distribution.	
Semester –I Paper No. II	UNIT I **Mineralogy**	**Mineralogy** Chemical bonding and compound formation. Mineral: definition, classification and composition. Physical properties of mineral. Introduction to common groups of rock forming minerals such as Olivine, Pyroxene, Amphibole, Mica, Silica and Feldspar. Study of Common ore minerals, industrial minerals and atomic minerals.	After completing this lesson on rocks and minerals, students will be able to: Compare the characteristics of rocks and minerals. Classify rocks and minerals. Use content-specific vocabulary when discussing rocks and minerals.
	UNIT -II **Crystallography**	**Crystallography** Elementary ideas about crystal structure. Crystal: faces, edges, solid angles. Crystallographic axes andaxial angles. Interfacial angles, Contact Goniometer; Parameters and indices; Crystal symmetrycharacters. Classification of crystals into six systems for normal classes such as Cubic, Tetragonal,Hexagonal, Orthorhombic, Monoclinic and Triclinic systems and their forms Twin and Twin laws.	Study helps to understand the crystal structure of materials. Fundamental concepts including lattices, symmetries, point groups, and space groups will be discussed and the relationship between crystal symmetries and physical properties will be addressed.
Semester –II	Unit –I	**Physical Geology –** Geological processes such as erosion,	Understand that Earth is a complex system of interacting rock, water, air, and life, and how

Paper No. III **Physical Geology and Palaeontology**		transportation and deposition by river, wind, glaciers, ocean and sea.	these elements have shaped Earth's surface. Understand that earth is continuously changing, both on the surface and in the interior.
	Unit –II	**Palaeontology-** Definition and scope of palaeontology. Geological Time Scale, processes of fossilization and preservation. Elementary ideas about origin of life, evolution and fossil record. Systematic classification of organisms, their morphological characters and geological distribution of phylum Arthropoda (Trilobites), Coelenterate (Graptolites), Mollusca (Lamellibranch, Gastropod and Cephalopod), Brachiopods and Echinodermata.	Understanding of Paleontology and Fossil Study: Students will comprehend the nature, preservation, and significance of fossils, learn about the taxonomy of various phyla including Mollusca, Brachiopoda, Arthropoda, and Echinodermata, and understand the geological history and morphological characteristics of these groups.
Semester –II Paper No. IV	Unit –I	**Igneous Petrology:** Definition, composition & origin of magma. Origin, Forms, Textures, structures and classification of igneous rocks .Study of common igneous rocks. **Metamorphic Petrology:** Agents and kinds of metamorphism, metamorphic minerals, structures of metamorphic rocks. Processes of formation of various metamorphic rocks by the process of Cataclastic, Thermal, Dynamothermal and Plutonic metamorphism. Study of common metamorphic rocks.	On completion of the course, the student should be able to: a) Determine the evolution of igneous rocks using petrographical, mineralogical and geochemical indices metamorphism Understanding nature of metamorphic rocks in contrast to igneous and sedimentary rocks
	Unit –II	**Sedimentary Petrology (Periods-10, Marks 20)** Sedimentary Petrology: Weathering, soil formation, soil profile, soil types and soil properties. Origin, transportation, deposition, consolidation and digenesis of sediments. Sedimentary textures. Classification of sedimentary deposits and study of common sedimentary rocks.	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

Specify Course Outcome:

1. Student will be able to design algorithms to solve different problems
2. Student will understand how to solve problems using computers

The course is designed to understand the basics of mineralogy and crystallography which helps to gain overall knowledge in Geology. The course deals with the study of crystals with respect to their morphology, symmetry, notations, normal crystal classes and various laws of crystallography. The course deals with the study of minerals, their physical, chemical and optical characteristics. The students will be able to identify common rock forming minerals in hand specimens and in thin section. The students will gain knowledge about various mineral groups.

Signature of Teacher

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Pro-forma for program and course outcomes (2.6.1)

Department: Geology

Program: B.Sc. S.Y. **Subject**: **Geology** **Course Code**: **CCG –III and IV**

Name of Teacher: Dr. R. B. Muley And Dr. Md .Babar

Paper Title: - Optical and Descriptive Mineralogy (P-VI)
Dynamics of the Earth and Igneous petrology (P-VII)
Structural geology (P-VIII)
Sedimentary and Metamorphic Petrology – (P-IX)

Unit Number	**Unit Name**	**Topics**	**Unit-wise Outcome**
Semester –III Paper No. VI	UNIT I	**Optical Mineralogy-I :** Introduction to petrological microscope. Nature of Light, reflection, refraction, doublerefraction, total internal reflection and critical angle. Nicol's prism, position of extinction, and extinction angle, isotropism and anisotropism, isotropic and anisotropic minerals. Birefringence, refractive index, use of accessory plates, compensation and determination of interference colours, Newton's scale, determination of sign of elongation where 'C' axis is known.	Minerals are fundamental units of earth crust and rocks are aggregate of minerals understanding of minerals help to explore the chemistry of the Earthoptical mineralogy courses in India help students learn about the optical properties of minerals and identify them using these properties: Understand transparent minerals: Students learn about transparent rock-forming minerals. Identify minerals: Students learn to identify minerals by their optical properties, such as those observed under a polarizing microscope. Study mineral characteristics: Students study the physical, chemical, and optical characteristics of minerals. Identify common minerals: Students learn to identify common minerals in hand specimens and thin sections.
	UNIT II	**Optical Mineralogy -II:** Vibration direction and optic orientation, anomalous colours, pleochroism and absorption. Uniaxial and biaxial interference figures and determination of optic sign of uniaxial and biaxial minerals. Methods of determination of refractive index: Becke line, Oblique illumination and liquid immersion method. Study of optical properties of minerals.	

	UNIT III Descriptive Mineralogy	**Descriptive Mineralogy - I:** Introduction to mineral, silicate structure, isomorphism, polymorphism and pseudomorphism. Classification of minerals. Study of structure, chemistry, physical and opticalproperties, paragenesis and uses of the following mineral groups:Olivine, garnet, alumino-silicate, pyroxene,	Knoledge of Descriptive mineralogy helps the students to classify the minerals into groups based on their shared properties such as Chemical composition 2. Occurrence 3. Crystallization 4. Structure 5. General physical properties 6. Application It developes the ability to identify and to differentiate the minerals in hand specimen and to determine the specific gravity of minerals.
	UNIT III Descriptive Mineralogy	**Descriptive Mineralogy –II:** Study of structure, chemistry, physical and optical properties, paragenesis and uses of the following mineral groups: Amphibole, mica, silica, feldspar, felspathoid	
Semester –III Paper No. VII	**UNIT I**	**Dynamics of the Earth-I** Isostasy: Concept and theories of Isostasy; Geosynclines; Theories of Continental drift and its evidences and Palaeomagnetism.	The students will able to learn the dynamic nature of the Earth processes. They will learn about the geodynamics of the lithosphere, concept of Isostacy, ocean floor spreading, continental drift, plate tectonics, volcanism, earth quakes etc
	Unit – II	**Dynamics of the Earth-II** Evolution of plate tectonic theories, nature and types of plate margins. Origin and significance of Mid-oceanic ridges. Island arc and trenchs. Sea-floor spreading and Wilsoncycle.	
	UNIT -II	**Igneous Petrology -I** Formation of glass and crystal. Crystallization of unicomponent magma. Crystallization ofbinary magma, eutectics and mixed crystals. Crystallization of Ternary magma. Reactionrelation and Bowen's reaction series.	On completion of the course, the student should be able to: a) Determine the evolution of igneous rocks using petrographical, mineralogical and geochemical indices
	Unit – IV	**Igneous Petrology -II** Textural characters such as granularity, shape of the crystal, mutual relation of crystals,textures and their types. Microstructures and structures of igneous rocks. Classification ofigneous Rocks. Theories of differentiation and assimilation. Crystallisation of Granitic andBasaltic magma. Study of common igneous rocks.	
Semester –IV Paper No.VIII	Unit -I	Introduction, Attitude of beds, strike and dip, study of clinometers compass, Brunton compassand its application in the field survey. Fold: Parts of fold, nomenclature of folds, plunge of folds,types of fold and field study of folds. Determination of top of beds by using primary structures	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,

	Unit -II	**Fault:** General characteristic of fault, types of movement, classification of fault based on geometry, genetic and net slip. Attitude of faults relative to attitude of beds, fault pattern and value of dip of fault. Criteria for recognition of fault in field such as discontinuity of strata, repetition and omission of beds, feature characteristic of fault plane surface and physiographic criteria.	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.
	Unit -III	**Joint:** Introduction, Genetic and geometric classification of joints.Unconformity: Introduction, general significance of unconformity. Types of unconformities such as disconformities, angular unconformity, non-conformity and local unconformity. Overlap, offlap, overstep, outlierand inlier.	
	Unit -IV	Distinction between unconformities and fault.Lineation and Foliation: Introduction, descriptive terminology, kinds, origin and relation to themajor structures.Schistosity: In relation with lineation and foliation.	
Semester –IV Paper No.IX	Unit-I	**Sedimentary Petrology-I: -** Formation of sediment and sedimentary rocks. Different types of depositional environment such as terrestrial and marine environment. Mineral composition of sedimentary rocks. Texturalcharacters such as grain size, sphericity, roundness and shape. Mechanical, chemical and organicstructures. Maturity of sediments. Heavy Minerals.	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 rom deposition to diagenesis.
	Unit-II	**Sedimentary Petrology-II** Introduction, mineralogy, texture, structure, classification and economic importance of conglomerate, sandstones, shale and limestones. Study of common sedimentary rocks.	
	Unit -III	**Metamorphic Petrology-I -** Agents and kinds of metamorphism. Concept of depth zones and grades of Metamorphism. Metamorphic facies and Eskola's concept of metamorphic facies. Pressure- Temperature Diagram. Metamorphic minerals (stress and antistress minerals) Texture and structure of metamorphic rocks.	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

	Unit -IV	Metamorphic Petrology-II Process of formation of metamorphism such as ataclastic, thermal, dynamothernmal, plutonic metamorphism and their products. Metasomatism, pneumatolytic etamorphism, injection metamorphism and Auto-etamorphism. Lit-per-lit gneiss, composite gneiss. Anatexisand palingenesis. Study of common metamorphic rocks.	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

Specify Course Outcome: Describe various hypothesis of origin of earth and solar system. Describe internal structure and composition of the earth. Describe volcanic activity, types of volcanoes, volcanic products. Explain the relation of diastrophic movements with plate tectonics. What are the various geological processes involving in creation of various land forms due to different geological agents. Classify rocks on the basis of origin. Describe forms of igneous rocks and gives the classification. Describe crystallization of Magma, and explain how uni component, bicomponent and multi component magma gives rise to different types of rocks.

Specify Program Outcome: The study of this paper strengthens students' knowledge with respect to understanding the essentials of the dynamics of earth. The students will understand the origin and age of our Solar system and planets including earth. The students will able to learn the dynamic nature of the Earth processes. They will learn about the geodynamics of the lithosphere, concept of Isostacy, ocean floor spreading, continental drift, plate tectonics, volcanism, earth quakes etc. The course present concepts of geomorphology in relation with geological processes and evolution of land forms. PSO-5 The course presents an understanding of the endogenic and exogenic processes in action on the earth surface and creation of various land forms by various geological agents like river, glaciers, sea and oceans, wind etc.

The course of this paper designed to understand the processes involved in the formation of rocks i.e., building blocks of earth. The students will be able to understand the formation of igneous, metamorphic and sedimentary rocks. They acquaint about various processes responsible for the formation of different types of rocks. The students will understand the forms, structure, texture of igneous rocks interpreting crystallization history. The course presents an understanding of effects of high temperature and pressure transforming affected rocks in to metamorphic rocks. The students will know the processes of sedimentation, lithification, diagenesis which converting loose sediments into consolidated sedimentary rocks.

Signature of Teacher

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Program and course outcomes (2.6.1)
Department: Geology

Program: B.Sc. TY. Sem- V and VI
Subject: Geology
Course Code: CCG –V and IV

Name of Teacher: Dr. R. B. Muley And Dr. Md .Babar

Paper Title: - Geomorphology and Photo-Geology (P-XII)
Engineering and Hydrology (P-XIII)
Environmental Geology (P-XIII) Elective-I
Stratigraphy of India (P-XIV)
Economic Geology and Prospecting (P-XV)
Groundwater exploration and Management (P-XV) Elective-II

Unit Number	Unit Name	Topics	Unit-wise Outcome
Semester –III Paper No. XII	UNIT- I	**Geomorphology** -Introduction and concepts of geomorphology, study of geomorphic surface features (land forms) of Fluvial and Aeolian action	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.
	UNIT II	Study of geomorphic surface features (land forms) of Glacial and Marine origin.	
	UNIT III	**Photogeology** - Introduction to aerial photography, satellite imageries and preparation of photogeological maps. Elements of aerial photo interpretation. Stereoscopic vision, orientation of stereoscope, stereo-pairs and stereo viewing of air photos, types of aerial photographs and photo index. Scale of aerial photographs. Application of Aerial photographs in the study of lithology and structure.	In this course a student will learn about 1) the basic concepts of remote sensing, 2) Basic oncepts of Photogeology and potogrammetry, 3) the basic concepts of GIS, 4) GIS softwares viz., QGIS, Basic concepts and functioning of In Global Positioning System (GPS). Understanding of Photo Geology: Students will acquire a fundamental understanding of photogeology, including knowledge of the electromagnetic spectrum, types and geometry of aerial photographs, and factors affecting aerial photography. • Proficiency in Remote Sensing Fundamentals: Students will learn about the basics of remote sensing, remote sensing systems, and sensors. They will be able to understand the signatures of rocks, minerals, and soils, and apply remote sensing knowledge in geosciences and geomorphological studies. •
	UNIT III	Application of Aerial photographs in the study of geomorphology. Introduction to remote sensing and applications in Geology	

Semester –III Paper No. XIII	UNIT I	**Engineering Geology-**Concept and definition of engineering geology and environmental geology. Environmental and geological hazards such as earthquake volcano and mass movement.	Understanding Environmental Geology: Students will learn fundamental principles of environmental geology, including the causes and remedies of geological hazards such as landslides, earthquakes, and volcanic hazards.
	Unit – II	**Environment** and geological consideration in the location and construction of engineering structures such as dams, reservoirs and tunnels. Drilling and its application in Engineering geology	Identify the available minerals by **1.** their properties and behaviour. Classify and identify the available rock in the construction site. interpret the different geological features and their engineering importance. apply the geological concepts in civil engineering projects. 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.
	UNIT - III	**Hydrogeology-(**Introduction, hydrologic cycle, water table, aquifer and its classification.Aquifer properties such as porosity, permeability, specific yield, specific retention,storativity, hydraulic conductivity. Darcy's law,	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.
	Unit – IV	Occurrence of groundwater in igneous, sedimentary and metamorphic rocks. Hydrological prospecting. Concept of watershed. Methods of soil and water conservation.	
Semester –III Paper No.XII Elective –I	Unit -I	**Environmental Geology**: Definition of ecology and environmental Geology. Different ecosystems. Classification of Natural resources. A short account of renewable and non-renewable resources	Students will know about the 1.environment importance & geologists role on it 2 waste disposal types & its importance and using the remote sensing in geological studies. 3. mining impacts & precautions taken by the civil engineers while constructing the dams etc. 4. floods, earth quakes, etc and ready to protect others.
	Unit -II	Environmental problems due to surface geological processes. Causes, hazards and remedial measures relating to landslides, floods, and soil erosion, Impact of wind on environment. Degradation of coastal environment and measures for coastal protection.	
	Unit -III	Influence of deep seated geological processes – Earthquake hazards, Earthquake prediction control and warning. Hazards of volcanism; Techniques of volcanic prediction and human adjustments to volcanic environments. .	

	Unit -IV	Man as an agent of environmental modifications Environmental degradation due to mining and mineral processing. Effects of urbanization on surfacewater, causes for ground water pollution. An outline on Global Warming and Climate changes.	
Semester –VI Paper No.XIV Stratigraphy of India	Unit-I	**Stratigraphy**-I-Principles of stratigraphy, units of stratigraphy, principles of correlation.Physiographic divisions of India. Occurrence, distribution, classification, lithology andeconomic importance of following super-groups/groups: Archean of central province,Singhbhum, Eastern Ghats, Delhi, Dharwar, Cuddupah,	Mastery of Stratigraphy: Students will understand the basic principles and nomenclature of stratigraphy and learn about the stratigraphic distribution of various rock groups throughout different geological periods in India. They'll gain practical experience in preparing stratigraphic columns and conducting field studies in type areas. • Comprehensive Knowledge of Paleozoic, Mesozoic, and Cenozoic Rocks: Students will acquire a detailed understanding of the distribution and classification of Paleozoic, Mesozoic, and Cenozoic rocks in India, their marker fossils, and significant geological formations associated with these periods.
	Unit-II	Occurrence, distribution, classification, lithology and economic importance of followingsuper-groups/groups: Vindhyan, Gondwana and Deccan Traps.	
	Unit -III	Occurrence, distribution, classification, lithology and economic importance of supergroups/ roups : Geology of Kashmir, Spiti valley and Siwalik,	
	Unit -IV	Occurrence, distribution, classification, lithology and economic importance of supergroups/groups : Marine formations of Jurassic of Kutch, Cretaceous of Tiruchirapalli and Tertiary rocks of Assam.	
Semester –VI Paper No.XV Economic Geology and Prospecting	Unit-I	Economic Geology: Introduction of economic geology, magma and mineral deposits.Metallic and non-metallic ore deposits. Processes of formation of mineral deposits such as:Magmatic concentration, sublimation, metasomatism, metamorphism, hydrothermalprocess, supergene sulphide enrichment, sedimentation, residual and mechanicalconcentration	Knowledge of Economic Geology: Students will understand the scope of economic geology, including syngenetic and epigenetic minerals deposits, and the classification of mineral deposits. They'll gain an understanding of ore genesis, control of ore mineralization, magmatic and hydrothermal processes, and the geographical and geological distribution of various ore deposits in India. Additionally, they will acquire skills in the megascopic study and identification of various ore minerals..
	Unit-II	Occurrence, geological and geographical distribution and uses of following mineral deposits of India: Iron, chromite, copper, manganese, lead & zinc, gold, bauxite, gypsum, asbestos, mica, uranium, precious and semiprecious stones.	

	Unit -III	**Prospecting:** Introduction. Geophysical method of prospecting (Instrument, field procedure and interpretation) based on magnetic, gravity, electrical, seismic studies.	Proficiency in Mineral Exploration Techniques: Students will acquire a firm understanding of magnetic, electromagnetic, radiometric, and seismic methods of mineral exploration, as well as principal methods of geological prospecting. They'll also gain exposure to the instruments used in geological prospecting.
	Unit -IV	Geological method of prospecting. Geochemical method of prospecting including leakage anomalies and pathfinder elements.	
Semester –VI Paper No.XV (Elective – II) Groundwater Exploration and Management -	Unit -I	Introduction: Definition of Hydrology, Hydrogeology, Scope and application of Hydrogeology. Hydrological Evaporation, Condensation, Precipitation, Infiltration, Transpiration. Evapotranspiration, Runoff, connate water. Groundwater: Origin, Occurrence and age of groundwater, Vertical distribution of sub-surface water, zone of aeration-soil water, vadose water, and capillary fringe. Zone of saturation - water table. Perched water table. Recharge and discharge areas.	This course will provide an insight into the field of groundwater hydrology. The students will equip themselves with the knowledge of interpretation of groundwater data, conducting the surface and subsurface investigations for the groundwater using the latest methods and tools. The students will be able to learn basic fundamentals of groundwater flow, storage and yield. They will also learn various methods of well development. The concepts of groundwater basin management, conjunctive use, competing demands, recharge and mining will add in equipping students to take better decisions in groundwater management.
	Unit -II	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), Darcy's law, permeability, hydraulic conductivity, velocity of groundwater flow, storage co-efficient. Types of aquifers: confined, semi-confined, and unconfined. Homogeneous, Heterogeneous. Isotropic and Anisotropic aquifers. Igneous, sedimentary and metamorphic rocks as aquifers.	
	Unit -III	Quality of Ground Water: Physical, chemical and Biological characteristics of groundwater.Suitability of groundwater for drinking, Irrigation and industrial purposes. Pollution of Groundwater; Pollution in relation to urban, industrial and Agricultural sources. Brief account of saline water intrusion. Groundwater Investigations: Scope of investigations, Methods of groundwater explorations, Brief account of Geological, hydrogeological, Geobotanical investigations, Introduction to Remote Sensing techniques. Geophysical Exploration: Basic principles of Geophysical exploration methods; Electrical methods -Schlumberger and Wenner configuration, Resistivity profiling and Vertical Electrical Sounding	

	Unit -IV	Management Of Groundwater: Groundwater balance, recharge, (natural and artificial) and discharge. Safe yields and over draft. Conjunctive use of surface and groundwater.Utilization of groundwater. Groundwater resource evaluation-water table fluctuation method and rainfall infiltration methods. Groundwater provinces of India. Concepts ofwatershed management.	

Specify Course Outcome: Give an account of non-conventional energy resources. Describe magmatic concentration processes and resultant deposits. Describe Hydrothermal processes and resultant deposits. Give an account of mechanical and residual concentration processes and resultant deposits. Describe Oxidation and supergene sulphide enrichment processes, resultant deposits. Give an account of sedimentary and metamorphic processes of ore formation. Describe the Occurrence of fossil fuels in India.

Specify Program Outcome: Course topics include the conventional and non-conventional energy resources. This course introduces the students to various processes of mineral deposit formations. The Course deals with occurrence, origin, economic importance, distribution of selected ore minerals. The students will know origin and occurrence, distribution of coal, petroleum in India.

Programme Learning Outcomes in B.Sc. with Geology 1. Mastery of Fundamental Concepts: Graduates will have a strong foundation in the basic principles of geological sciences, including understanding the earth's systems, processes, materials, history, and their interrelations. **2.** Advanced Knowledge in Specialized Areas: Graduates will gain deep knowledge in various specialized fields of geology such as petrology, stratigraphy and paleontology, geochemistry, photogeology and remote sensing, economic geology, environmental geology and geohydrology, fuel geology, and Himalayan geology**. 3.** Field and Lab Skills: Graduates will acquire practical skills in identifying and classifying rocks, minerals, and fossils, interpreting geological maps and satellite images, and performing geochemical analyses. They will be competent in various geological field methods, including stratigraphic columns preparation, geological prospecting, and borehole drilling. **4.** Critical Thinking and Problem-Solving Skills: Graduates will be able to apply geological principles to solve complex problems, predict natural hazards, and make informed decisions about resource management and environmental protection. **5.** Appreciation for Earth's History and Evolution: Graduates will have an appreciation for the long history and dynamic nature of the earth, understanding the processes of evolution and the importance of geological time. **6.** Awareness of Geological Impact: Graduates will understand how geological events and processes impact the environment and human society. They will be conscious of the role of geologists in society and the responsibilities that come with this profession. 1 **7.** Preparation for Advanced Study and Professional Careers: Graduates will be well-prepared for advanced study in geology or related disciplines and for professional careers in the geological sciences, including energy, mining, environmental consulting, hazard assessment, and government or academic research. **8.** Effective Communication Skills: Graduates will be able to effectively communicate complex geological concepts and findings to both specialist and non-specialist audiences. This includes the ability to create clear, well-organized written reports, oral presentations, and graphic materials. **9.** Engagement with Ethical Practices: Graduates will understand the ethical considerations in geological practice, including responsible use of resources, appropriate handling of data, and considerations of the environmental and societal impact of geological activities. **10.** Adaptability and Lifelong Learning: Graduates will be able to adapt to new

technology and advancements in the field of geology. They will embrace the spirit of lifelong learning to stay abreast of changes in the field.

Geology is a specific subject of Science with a Multidisciplinary approach. Student doing graduation with B.Sc. in Geology should be able to: **1** Understand the basic geological concept, principles and theories of stratigraphy. **2.** Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classroom. **3.** Expose the student to the vast scope of Geosciences in the field of disaster management, watershed management, water pollution, oil exploration, mining etc**. 4.** Emphasize the importance of geology as the most important discipline for sustaining the existing industries and establishing new ones to create job opportunities at all levels of employment. The UG Course program of Geology comprises of 3 year integrated degree course consisting of six papers encompassing various branches of Geology to achieve aim of study.

Signature of Teacher