

Department of Geology
Govt. Science College, Jabalpur (MP)

Program Specific Outcomes and Course Outcomes of Geology at UG level

Students graduating with a B.Sc. in Geology should be able to:

- ◆ Recognize common Earth materials and structures.
- ◆ Place basic geologic observations (e.g. rock type, structure, seismicity, and volcanism) into a broader plate tectonic framework.
- ◆ Describe how geologists construct the geological time scale and apply age dating.

The UG pass course programme of Geology comprises of 3 Year Degree Course consisting of six papers encompassing various branches of geology to achieve aim of study.

B.Sc. 1st Year Paper – I Geodynamics and Geomorphology

Program Specific Outcomes:

- PSO-1.** Geodynamics course of study designed to know about various hypothesis of origin of the Earth (Solar System).
- PSO-2.** Broad perspective of crust, mantle and core of the Earth and reorganization of the Earth's layers.
- PSO-3.** Knowledge of volcanism, isostasy, drifting continents, mid-oceanic ridges, island arcs earthquakes and their relation with plate tectonics.
- PSO-4.** This course on the principles of geomorphology looks at the relationship between geological processes and evolution of landforms at a variety of scales in space and time.
- PSO-5.** It examines endogenic processes originating within the earth like diastrophism, volcanic activity exogenic processes occurring at the earth surface by various geological agents like rivers, glaciers, sea and oceans and wind how they interact to create landforms.

Course Outcome

- CO-1.** Describe uniformitarian and catastrophic hypotheses of origin of the Solar system.
- CO-2.** Describe internal structure and composition of the Earth.
- CO-3.** Give an account of various diastrophic movements and relate with plate tectonics.
- CO-4.** What is volcanic activity? Describe various types of volcanoes
- CO-5.** Give an account of geological processes involving in erosion and creation of landforms.
- CO-6.** Classify and describe landforms in a variety of environmental settings.

B.Sc. 1st Year Paper – II : Crystallography and Mineralogy

Program Specific Outcomes:

- PSO-1.** The course's specific aim is to acquaint students about crystal structures and their classification into unit systems and symmetry classes.
- PSO-2.** To acquaint students about various laws of crystallography governing the consistency of crystal structures with respect to specific chemical composition.
- PSO-3.** Mineralogy leads to gain knowledge of composition of rocks and in-turn the earth's composition.
- PSO-4.** To show how elements combine to produce crystal forms, introducing the principles of crystallography and mineralogy.
- PSO-5.** To identify minerals; various properties or criteria are applied like physical properties, chemical composition and optical properties.

PSO-6. Identification of most common minerals and mineral groups are introduced.

Course Outcome

CO-1. Identify crystal's structural system, symmetry class and morphological forms present in the given symmetry class.

CO-2. Describe laws of crystallography.

CO-3. Describe in general physical properties of the given mineral group.

CO-4. Describe physical and optical properties of the given mineral.

CO-5. Explain, knowledge of mineralogy leads to understand Petrology.

CO-6. Detail write-ups on isomorphism, polymorphism, pseudomorphism, and solid solution.

B.Sc. 2nd Year Paper-I: Petrology

Program Specific Outcomes:

PSO-1. To introduce the principal building blocks of the Earth i.e. rocks and their composition, formation and origins.

PSO-2. To demonstrate how minerals aggregate form rocks.

PSO-3. To outline the petrogenesis demonstrating how varieties of minerals and rocks crystallize out in magmatic system.

PSO-4. Magma origin and its emplacement in the crust and outpouring on the surface of the earth giving rise various forms.

PSO-5. Structure and texture of igneous rocks interpreting crystallizing history.

PSO-6. To know about the processes of sedimentation giving rise clastic and non-clastic sediments.

PSO-7. Environments under which variety of sediments deposited and processes of lithification and diagenesis converting these loose sediments into consolidated sedimentary rocks.

PSO-8. Structure and texture of sedimentary rocks interpreting sedimentation basin and provenance.

PSO-9. Effects of high temperature and pressure transforming affected rocks into metamorphic rocks.

PSO-10. Study of structure and texture of metamorphic rocks interpreting degree of P-T conditions during the re-crystallization.

Course Outcome

CO-1. Define and classify rocks on the basis of origin.

CO-2. Explain how primarily originated rocks gives rise to secondary e.g. sedimentary and metamorphic.

CO-3. Describe how the processes of weathering and erosion not only change surface features of the earth but also give rise new rock types.

CO-4. Describe how texture and structure help to discriminate origin of rock types.

CO-5. Give an account of kinds of metamorphism and give metamorphic mineral zones of polytropic metamorphic rocks.

CO-6. List and describe in general metamorphic facies.

CO-7. Describe sedimentation processes and explain sedimentary provenance and basin.

CO-8. Describe various sedimentary structures.

CO-9. Describe various sedimentary textures of clastic and non-clastic rocks.

CO-10. What are molasses and flysch sedimentary facies.

B.Sc. 2nd Year Paper-II: Structural Geology

Program Specific Outcomes:

- PSO-1.** Aim of the branch 'Structural Geology' is to introduce various mega structures developed in rocks whether contemporary or epigenetic.
- PSO-2.** Concept of rock deformation in time and space.
- PSO-3.** To determine possible causes of their formation and forces working behind it.
- PSO-4.** Relation of structure with tectonic movement.
- PSO-5.** Introduction to equipment and field tools to collect data for laboratory analyses.

Course Outcome

- CO-1.** Describe various stage of rock deformation.
- CO-2.** Describe stress and strain. How structural paragenesis is determined?
- CO-3.** Describe how geological history of an area synthesizes.
- CO-4.** Give classification and describe various types of folds and their recognition criteria.
- CO-5.** Describe faults on the basis of geometrical pattern.
- CO-6.** Give classification of joints and describe joints of tectonic origin.
- CO-7.** How do you interpret tectonic setup of a region based on structural record of the area?
- CO-8.** Explain effects of structures on outcrop pattern.
- CO-9.** Give an account of linear and planar structures and describe secondary foliations.
- CO-10.** Give an account of primary and secondary lineation.

B.Sc. 3rd Year Paper-I: Paleontology and Stratigraphy

Program Specific Outcomes

- PSO-1.** Demonstrate understanding of the nature of fossils and types of fossilization that turn organic remains into fossils.
- PSO-2.** Be able to recognize the major groups of invertebrate fossils on the basis of their morphology and be able to identify key index fossils to the species level.
- PSO-3.** Use fossils to recognize the age of sedimentary strata.
- PSO-4.** Demonstrate understanding of the uses of fossils in solving geological problems: paleoenvironments, relative age, paleo-ecology.
- PSO-5.** Demonstrate understanding of the fundamental stratigraphic units and the scientific methods for determining the relative and absolute ages of Earth materials and events.
- PSO-6.** Be able to determine the depositional environment from rock type and outcrop pattern. Understand the age and significance of depositional sequences.
- PSO-7.** Be able to decipher the geological history of an area from a geological map.
- PSO-8.** Knowledge of the stratigraphy of India.
- PSO-9.** Information about fossil content; and mineral deposits associated with the stratigraphic units.

Course Outcomes

- CO-1.** Define fossil, ichnofossil and index fossils.
- CO-2.** Describe processes of fossilization.
- CO-3.** Application of fossils in establishing age of the rock unit and correlation with other area.
- CO-4.** Use of fossils in finding mineral deposits.
- CO-5.** Ability to identify and description of morphology of the fossils in laboratory works.
- CO-6.** Give an account of various stratigraphic units.
- CO-7.** Give an account of criteria of stratigraphic correlation.

- CO-8.** Give stratigraphic column, distribution in India, fossil content and economic importance of a given geological formation.
- CO-9.** Describe stratigraphy and distribution of rock units containing coal horizons.
- CO-10.** Describe stratigraphy and distribution of rock units containing hydrocarbon in it.

B.Sc. 3rd Year Paper-II: Earth Resources and Applied Geology

Program Specific Outcomes

- PSO-1.** Introduction to various processes of mineral deposit formations.
- PSO-2.** Study of selected ore-minerals and mineral deposits of India with reference to their mode of occurrence, geographic distribution and economic importance.
- PSO-3.** Origin and occurrences of coal and petroleum deposits and their distribution in India.
- PSO-4.** Application of geological knowledge in civil engineering like dams, tunnel and canal.
- PSO-5.** Hydrological properties of rocks and occurrences of groundwater.
- PSO-6.** Basic idea and application of photogeology in mineral exploration.
- PSO-7.** Introduction to surface and subsurface mining.

Course Outcomes

- CO-1.** Give an account of formation of mineral deposits and their occurrences.
- CO-2.** Give distribution, composition and minerals, mode of occurrences uses of a give metallic mineral.
- CO-3.** Give composition, mode of occurrences and distribution in India of a mineral given in curriculum.
- CO-4.** Describe basins of fossil fuel in Indian.
- CO-5.** Give an account of geological considerations in various civil engineering projects.
- CO-6.** Give an account of ground water distribution, aquifers and groundwater recharging.
- CO-7.** Describe various surface and sub-surface mining methods.
- CO-8.** Give an account of mining terminology.
- CO-9.** Describe types of aerial photographs.
- CO-10.** Describe elements of photo interpretation.

Program Specific Outcomes and Course Outcomes of Geology at PG level study

M.Sc. 1st Semester, Paper – I : Geodynamics

Program Specific Outcomes:

- PSO-1.** The course' specific attention is to acquaint students about seismic waves and their propagation in different media, earthquake belts, Earthquake zones of India, Seismograph, causes of Earthquake. Interpretation of internal structure of the Earth.
- PSO-2.** To give specific knowledge of volcanism, types and causes of volcanic eruptions, Migration of volcanoes, volcanic landforms, and Palaeomagnetism.
- PSO-3.** Development of the concept of Isostasy, Isostatic anomalies, Isostatic models, and Evidence.
- PSO-4.** An introduction to geosynclines, classification and evolution of Geosynclines, causes of subsidence and uplift.
- PSO-5.** To give knowledge of continental drift as plate motion, Development of the concept and theories of continental drift. Evidences of continental drift and polar wandering and Sea floor spreading.
- PSO-6.** Concept of plate tectonics. Types of plate boundaries, features of convergent and divergent boundaries. Arc-Trench system, volcanic mountain chain. Origin of the Himalayas

Course Outcome

- CO-1.** Describe seismic waves and their propagation in different mediums.
- CO-2.** Explain internal structures of the Earth.
- CO-3.** Give an account of types and causes of volcanic eruptions.
- CO-4.** Describe various volcanic landforms.
- CO-5.** Describe paleomagnetism and its importance in geology.
- CO-6.** Give concept of isostasy and isostatic models.
- CO-7.** What is continental drift? Discuss various theories of continental drift.
- CO-8.** Describe ocean floor spreading and give a note on arch-trench system.
- CO-9.** What is plate tectonics, add a note on plate boundaries and discuss origin of Himalayas.

M.Sc. 1st Semester, Paper – II : Structural Geology

Program Specific Outcomes:

- PSO-1.** Specific aim of the program in Structural Geology is to render understanding of the structures, their forms and origin that are found in the crustal rocks.
- PSO-2.** To render the understanding of various behaviours of rocks under stress, strain rates and surrounding conditions. Concepts of stress and strain analyses as applicable to deformations.
- PSO-3.** The geometric characterization, classification and types of structures such as folds, faults, cleavages, lineation, joints etc.
- PSO-4.** To render understanding of these structures in terms of their origin and mechanism involved.
- PSO-5.** Rendering practice to analyze strain, decipher stresses with various tools and techniques and field mapping.

Course Outcome

- CO-1.** How do you correlate response of rocks with stress system?

- CO-2.** How do you analyse different strains, pure shear and simple shear in progressive deformation.
- CO-3.** What are the elements of folded structures and how are these forms basis for geometric classification as well as genetic understanding?
- CO-4.** Discuss brittle failure, Mohr's diagram under various conditions, elements of faulting, and mechanism of faulting.
- CO-5.** Linear planar fabrics in rocks, their types and relation to major structures, petrofabric analyses.
- CO-6.** Show different stress conditions of emplacement of igneous plutons.
- CO-7.** Discuss tectonic framework of Indian subcontinent plate.

M.Sc. 1st Semester, Paper – III : Geomorphology

Program Specific Outcomes

- PSO-1.** To give knowledge of principle of geomorphology, cycle of erosion and slope forming processes; landslide.
- PSO-2.** To give knowledge of geological works of river and their landforms of erosion and deposition processes. Drainage pattern.
- PSO-3.** To give knowledge of geological works of glacier and their landforms of erosion and deposition processes. Glacio-fluvial activities.
- PSO-4.** To give knowledge of geological works of wind and their landforms of erosion and deposition processes.
- PSO-5.** To attribute knowledge of karst geomorphic cycle, characteristics of karst region, origin of limestone caverns.
- PSO-6.** To give knowledge of the topographic feature resulting from marine erosion and marine depositions and characteristics of emergence and submergence of coastline.
- PSO-7.** To give knowledge of morphometric analyses of terrains and drainage basin.

Course Outcomes

- CO-1.** Discuss various principles of geomorphology and add a note on cycle of erosion.
- CO-2.** What is landslide? Give measures of landslide mitigation.
- CO-3.** Give an account of drainage patterns and their importance in deducing structural and lithology of the area.
- CO-4.** Give an account of landforms of glacial erosion; add a note on glacio-fluvial activities.
- CO-5.** Describe landforms of arid desert in respect of erosion and deposition work of wind.
- CO-6.** Describe features of karst areas in view of erosion activities.
- CO-7.** What are the characteristics of emergence and submergence of coastline? Give an account of coast topography resulting from erosion.
- CO-8.** Describe various morphometric measures to study watershed of a region or basin.

M.Sc. 1st Semester, Paper – IV: Crystallography and Mineralogy

Program Specific Outcomes

- PSO-1.** To introduce how do minerals form.
- PSO-2.** To explain chemical composition, bonding and internal structure of minerals.
- PSO-3.** Classification of minerals as per processes of formation.
- PSO-4.** Determination of physical and optical properties of minerals.
- PSO-5.** Introduction to interaction of optics with mineral matter and their outcome.

PSO-6. Concept of geochemical classification of elements, and introduction to geochemical cycle.

Course Outcomes

- CO-1. Explain role of chemical bonding understand formation of minerals.
- CO-2. Give a classification of minerals as per their origin.
- CO-3. Describe properties of minerals in hand specimen.
- CO-4. Give a classification of minerals on the basis of optical behavior.
- CO-5. Discuss various properties of minerals observed under microscope.
- CO-6. Give geochemical classification of elements as given by Victor Goldschmidt.
- CO-7. Describe the concept of geochemical cycle commenting biotic and abiotic pathways.
- CO-8. Comment on nutrient biogeochemical cycle detailing carbon, nitrogen and hydrogen cycles.

M.Sc. IInd Semester, Paper - I: Igneous and Metamorphic Petrology

Program Specific Outcomes

- PSO-1. Introduction to origin of magma and its evolution.
- PSO-2. Phase equilibrium of magma crystallizing systems.
- PSO-3. Classification of igneous rocks
- PSO-4. Forms and structures of igneous rocks.
- PSO-5. Types of texture and their significance interpreting cooling history.
- PSO-6. Petrogenesis of common igneous rock types.
- PSO-7. Concept of prograde and retrograde metamorphism.
- PSO-8. Structures and textures of metamorphic rocks and their importance in understanding metamorphic reaction principle.
- PSO-9. Metamorphic mineral zones of different litho units.
- PSO-10. Metamorphic grades, facies and facies series. Facies classification. Types of Metasomatism and their important products.

Course Outcomes

- CO-1. Explain crystallizing phase equilibrium of multi component magma system.
- CO-2. Explain evolution of magma by different processes takes place from origin to emplacement.
- CO-3. Give an outline of classification of igneous rocks commenting especially given by IUGS.
- CO-4. Intrusive forms of igneous rocks and comment on their creation.
- CO-5. How textures are significant in explaining cooling history.
- CO-6. Describe petrogenesis of a given rock type.
- CO-7. Discuss grades of metamorphism.
- CO-8. Explain metamorphic reaction principle in delineating mineral zones.
- CO-9. Discuss metamorphic facies and facies series.
- CO-10. Describe progressive metamorphism of pelite litho unit.
- CO-11. Describe thermal metamorphism of impure carbonate rocks.

M.Sc. IInd Semester, Paper - II: Sedimentology

Program Specific Outcomes

- POS-1. Processes of sedimentation; Origin of sediments.
- POS-2. Primary, secondary and organic sedimentary structures and their importance.
- POS-3. Classification, nomenclature and characters of the common sediments- rudites, arenites and argillites and carbonate.
- POS-4. Textures of clastic and non-clastic sedimentary rocks and their significance.

- POS-5. Paleocurrent analyses and granulometric analyses of sedimentary rocks.
- POS-6. Lithification and diagenesis.
- POS-7. Elements and types of sediments depositional environments:
- POS-8. Concepts of sedimentary basins, provenance and facies.
- POS-9. Tectonic framework of sedimentation.

Course Outcomes

- CO-1. Explain various sedimentary processes involving origin of sediment.
- CO-2. Describe primary sedimentary structures and their role in paleo current analyses.
- CO-3. Give classification of common sediment and describe a class.
- CO-4. Describe clastic and non-clastic textures of sedimentary rocks.
- CO-5. Give an account of statistical measures of sediment particles analyses.
- CO-6. Explain diagenesis.
- CO-7. Give an account of sedimentary environment detailing any one.
- CO-8. Discuss role of heavy minerals in sedimentary provenance analyses.
- CO-9. Describe tectonic framework of sedimentation.

M.Sc. IInd Semester, Paper – III: Precambrian Stratigraphy of India

Program Specific Outcomes

- PSO-1. The specific aim of the program is to render understanding Geological Time, classification of sequences in terms of Litho-, Bio- and Chrono- stratigraphy. Tectonic framework.
- PSO-2. Growth of Cratons, the earlier crust through Archaean evolutions, formation of Fundamental Complex and Supracrustal rocks.
- PSO-3. Understanding Proterozoic mobile belts.
- PSO-4. Proterozoic basins on different Cratons.

Course Outcomes

- CO-1. How the rocks have been classified in geological sequences in lithostratigraphic units in terms of chronostratigraphic divisions?
- CO-2. What are major boundaries in geological time scale? Discuss the events related to the boundaries.
- CO-3. Discuss the litho-tectonic features of Dharwar, Bastar, Singhbhum, Bundelkhand and Aravalli Cratons their phases of evolution as fundamental platform and Supracrustal sequences in the economic importance.
- CO-4. Discuss Easternghat Mobile Belt and Satpura Mobile Belt; and their lithostratigraphic features.
- CO-5. Explain the stabilization of cratons after Archaean time and sedimentation of Proterozoic basin such as Cuddapah, Kurnool, Vindhyan etc.

M.Sc. IInd Semester, Paper-IV: Paleobiology

Programme Specific Outcomes

- POS-1. Morphology, classification, evolution, and geological history of major invertebrate classes.
- POS-2. Classification of vertebrates and general characters of various classes.
- POS-3. Succession of the vertebrate life through the geological time.
- POS-4. Evolutionary history of Human, Elephant and Horse.
- POS-5. Classification, separation, morphology, uses and geological history of foraminifers.
- POS-6. Concept of Palaeobotany and Palynology. Plant life through ages.

POS-7. Characteristic features and assemblage of the Gondwana flora.

Course Outcomes:

- CO-1. Give an account of morphology, classification, evolution, and geological history of a given invertebrate class.
- CO-2. Give classification of vertebrates and an outline of general characteristics.
- CO-3. Give an account of succession of vertebrate life through geologic time.
- CO-4. Discuss evolution of human.
- CO-5. Give morphology, uses and geological history of foraminifers.
- CO-6. Give an account of plant life through geologic ages.
- CO-7. Give distribution of flora during Gondwana time.

M.Sc. IIIrd Semester, Pape-I: Photogeology and Remote Sensing

Program Specific Outcomes

- PSO-1. Introduction to aerial photography. Types of aerial photos.
- PSO-2. Geometric principles of photographs.
- PSO-3. Preparation of Photo-geologic Maps.
- PSO-4. Mosaic controlling factors of aerial photograph.
- PSO-5. Electro-Magnetic Spectrum. Space platforms.
- PSO-6. Elementary idea about active and passive sensors. Multispectral Scanners. Thematic Mappers.
- PSO-7. Concept of Geographic information system.
- PSO-8. Application of photo-geology and remote sensing in geological studies.

Course Outcomes

- CO-1. Explain relief and tilt displacement, Vertical Exaggeration and distortions.
- CO-2. Describe how we take measurements of scales, distance, area, and height from aerial photographs.
- CO-3. Describe how we prepare photogeologic maps.
- CO-4. Explain the elements of photo-interpretation of aerial photographs.
- CO-5. What is EMR? Explain how EMR interact with different kinds of bodies on the earth.
- CO-6. Write an essay on Indian Remote Sensing mission.
- CO-7. Give an account of geogrphical information system.
- CO-8. Write in detail on multi spectrum sensor.
- CO-9. Give detail note on thematic mapper.
- CO-10. Discuss application of photo-geology and remote sensing in the study of geologic features.

M.Sc. IIIrd Semester, Paper - II: Engineering Geology

Program Specific Outcomes

- POS-1. Engineering properties of rocks.
- POS-2. Importance of geology in civil engineering projects.
- POS-3. Tunnel. Geological considerations for tunneling grounds.
- POS-4. Highway. Geological considerations for construction of highways.
- POS-5. Dam. Geological consideration for the selection of a dam site and Reservoir.
- POS-6. Dam. Problems related to failure of Dams. Grouting.
- POS-7. Bridge. Geological considerations for the concentration of bridges.
- POS-8. Canal. Geological considerations and lining.

POS-9. Landslide: causes, effects, and prevention.

POS-10. Geo-hazards: mitigation and management.

Course Outcomes

- CO-1. Give an account of engineering properties of rocks and describe these are determine.
- CO-2. Give an account of pros and cons of civil engineering in fold, fault, and joint affected areas.
- CO-3. Discuss geological considerations for tunneling grounds.
- CO-4. Explain geological considerations for construction of highways.
- CO-5. Write notes on dam and its parts and types of dam.
- CO-6. What are geological consideration for the selection of a dam site and Reservoir?
- CO-7. Write detail note on grouting.
- CO-8. Give an account of types of bridge and geological considerations for the sites.
- CO-9. Explain why lining of a canal is required?
- CO-10. Give an account of causes, effects, and preventing measures of landslide.
- CO-11. Give comment on consideration of civil engineering in seismic areas.
- CO-12. Discuss geo hazards its mitigation and management.

M.Sc. IIIrd Semester, Paper – III: Ore Genesis and Mineral Exploration

Program Specific Outcomes

- PSO-1. Various theories of ore genesis explaining how the various types of mineral originate and deposited within the Earth's crust making it valuable.
- PSO-2. In-depth explanation is given to understand processes of formation of mineral deposit.
- PSO-3. Students learn how prevailing geological features controls ore deposition and also serve as tools to find hidden treasure.
- PSO-4. Mineral exploration methods including geological, geochemical and geophysical are discussed to find and assess mineral deposits.
- PSO-5. Sampling is an essential tool to evaluate a deposit and knowledge of various methods is utmost required.

Course Outcomes

- CO-1. Distinguish how a particular mineral deposit formed by magmatic, hydrothermal, sedimentary, oxidation-reduction, metamorphic or by another processes.
- CO-2. Describe processes of hydrothermal deposits, both cavity filling and replacement.
- CO-3. Describe a given process of formation of mineral deposit.
- CO-4. Explain ore guide criteria to locate a deposit.
- CO-5. Describe control of ore deposits especially by moving hot solutions.
- CO-6. What is sampling? Discuss steps taken for the assessment of deposits.
- CO-7. Give an account of various techniques of mineral exploration.
- CO-8. Describe methods of geochemical exploration.
- CO-9. Describe magnetic method of geophysical exploration.
- CO-10. Describe resistivity method of mineral exploration.

M.Sc. IIIrd Semester, Paper – IV: Phanerozoic Stratigraphy of India

Program Specific Outcomes

- PSO-1. To render understanding of near complete Phanerozoic sequence in the Cenozoic Himalayan Mobile Belt. Precambrian – Cambrian boundary.

- PSO-2.** Rift valley (Pranhita – Godavari, Son – Narmada – Mahanadi – Damodar) coal bearing sequence from Permo-Carboniferous to Jurassic times.
- PSO-3.** Main transgression and regression of Permo-Carboniferous, Triassic, Jurassic and Cretaceous periods.
- PSO-4.** Cretaceous lacustrine and fluvial deposits.
- PSO-5.** Volcanic activity, K – T boundary, Continental Flood Basalt.
- PSO-6.** Foothill system of Himalayan Mobile Belt.
- PSO-7.** Glaciations.
- PSO-8.** Extinction and resurgence of life at boundaries of Geological Time Scale.

Course Outcomes

- CO-1.** Explain the Palaeozoic, Mesozoic and Cenozoic geology of the Himalaya along the section from Kashmir to Northeast of India.
- CO-2.** Give stratigraphy, distribution, depositional environment, climate changes and economic importance of Gondwana Supergroup.
- CO-3.** Explain marine transgression and regression phases in Manendragarh & Umaria and discuss marine fossils of Gondwanas. Explain the marine transgression, regression and fossils content of Jurassic of Kutch and Cretaceous of South India.
- CO-4.** Discuss Cretaceous deposits of Narmada Valley namely, Bagh Beds and Lameta Beds.
- CO-5.** Discuss Deccan volcanic Province. Type of eruptions, subprovinces, Intertrappeans.
- CO-6.** Discuss Siwalik System and its vertebrate life.
- CO-7.** Discuss glacio-fluvial deposits and glaciations. With special reference to Talcher Boulder Beds. Also, discuss Pleistocene glaciations.
- CO-8.** Record of life through Geological Time.

M.Sc. IVth Semester, Paper-I: Economic Geology

Programme Specific Outcomes:

- PSO-1.** Origin, composition, occurrences, prospecting and preparation of coal.
- PSO-2.** Origin, migration and accumulation of petroleum and natural gas.
- PSO-3.** Occurrences, association, distribution, prospecting and future possibilities of atomic minerals in India.
- PSO-4.** Origin, mode of occurrence, association, uses and Indian occurrences of the ores of important metallic minerals.
- PSO-5.** Origin, mode of occurrence, association, specification and grades for uses in industries and Indian occurrences of important non-metallic minerals.

Course Outcome

- CO-1.** Proximate and ultimate analysis of coal, and grading of coal.
- CO-2.** Describe various methods of coal preparation.
- CO-3.** Give an account of coal horizons of India.
- CO-4.** What is kerogen? Give an account of origin and migration of oil and natural gas.
- CO-5.** Describe various oil traps.
- CO-6.** List major radioactive minerals occur in India, briefing their mode of occurrences.
- CO-7.** Origin, mode of occurrence, association, uses and Indian occurrences of the ores of important metallic minerals.
- CO-8.** Give origin, mode of occurrences, association and grades for mineral used in cement industry.

- CO-9.** Give origin, mode of occurrences, association and grades for mineral used in fertiliser industry.
- CO-10.** Give origin, mode of occurrences and distribution of a selected economic mineral.

M.Sc. IVth Semester, Paper-II: Mining Geology and Mineral Dressing

Programme Specific Outcomes

- PSO-1.** Acquaintance with mining terminology and mining operations.
- PSO-2.** Knowledge of classification mining methods various mining processes.
- PSO-3.** Knowledge of opencast mining and underground mining of minerals and coal.
- PSO-4.** Knowledge of crushers, grinders and industrial screening in mineral dressing.
- PSO-5.** Knowledge of classifiers in laboratory sizing and industrial sizing of particles.

Course Outcome

- CO-1.** Give an account of mining terminology.
- CO-2.** Write notes on mine-supports, subsidence, mine ventilation, pumping of mine water.
- CO-3.** What is ocean bottom mining? How is it operated.
- CO-4.** Describe one of the drilling methods.
- CO-5.** Describe long wall method of coal mining.
- CO-6.** What strip mining? Describe opencast mining of coal.
- CO-7.** Give an account of primary crushers.
- CO-8.** Give an account of grinding mills.
- CO-9.** Describe various industrial screening.
- CO-10.** Describe different methods of particles separation.

M.Sc. IVth Semester, Paper-III: Hydrology

Program Specific Outcomes

- PSO-1.** Groundwater: Origin, importance, occurrences and subsurface reservoirs. Water table contour maps
- PSO-2.** Geological factors governing the occurrence of groundwater. Aquifers and their classification.
- PSO-3.** Broad perspective of groundwater flow and well hydraulics.
- PSO-4.** Physical, Chemical and Biological characters of groundwater quality; water contaminants and pollutants.
- PSO-5.** Problems of salt water intrusion in coastal aquifers, remedial measures.
- PSO-6.** Radio isotopes in hydrological studies.
- PSO-7.** Water harvesting. Consumptive and conjunctive use of surface and groundwater.
- PSO-8.** Watershed management. Natural and artificial recharge of ground water.
- PSO-9.** Wetland management.

Course Outcomes

- CO-1.** Discuss hydrological cycle and its importance.
- CO-2.** What is precipitation? Discuss its different types.
- CO-3.** Explain vertical distribution of water in the crust with diagram.
- CO-4.** Discuss porosity, permeability, specific yield and specific retention.
- CO-5.** What is aquifer? Describe their various types.
- CO-6.** Describe Darcy's Law.
- CO-7.** Describe Theis Equation of non-equilibrium condition.

- CO-8.** Describe physical and chemical characteristics of groundwater.
- CO-9.** Discuss about water contaminants and pollutants.
- CO-10.** Describe salt water intrusion in coastal aquifers and its remedial measures.
- CO-11.** Explain the role of Radio Isotopes in hydrological studies.
- CO-12.** Explain water harvesting and watershed management.
- CO-13.** Give in detail about natural and artificial recharge of groundwater.

M.Sc. IVth Semester, Paper – IV: Environmental Geology

Program Specific Outcomes

- PSO-1.** To render understanding of interdependent nature and processes operative over earth surface. The concept of systems in nature and the paradigm of environmental thinking. Various setups of environments and the alarm of global warming.
- PSO-2.** The techniques of evaluations and the concerned impact of human development on environment systems, impact on surface and subsurface water resources.
- PSO-3.** Concept of naturally deteriorating system as desertification concept and quality of self balancing systems in nature and human interference.
- PSO-4.** Understanding of energy resources exploitation and interference.
- PSO-5.** Natural hazardous systems.

Course Outcomes

- CO-1.** How to identify impact by urbanization on water resources and pollution of water resources?
 - CO-2.** What is environmental impact of industrialization and energy resources development?
 - CO-3.** Explain mining and pollution.
 - CO-4.** What is the importance of environmental development; conservation of natural system and environmental engineering to regain ecosystem?
 - CO-5.** Assessment of Anthropogenic impact on natural resources.
 - CO-6.** What are various natural hazards?
-