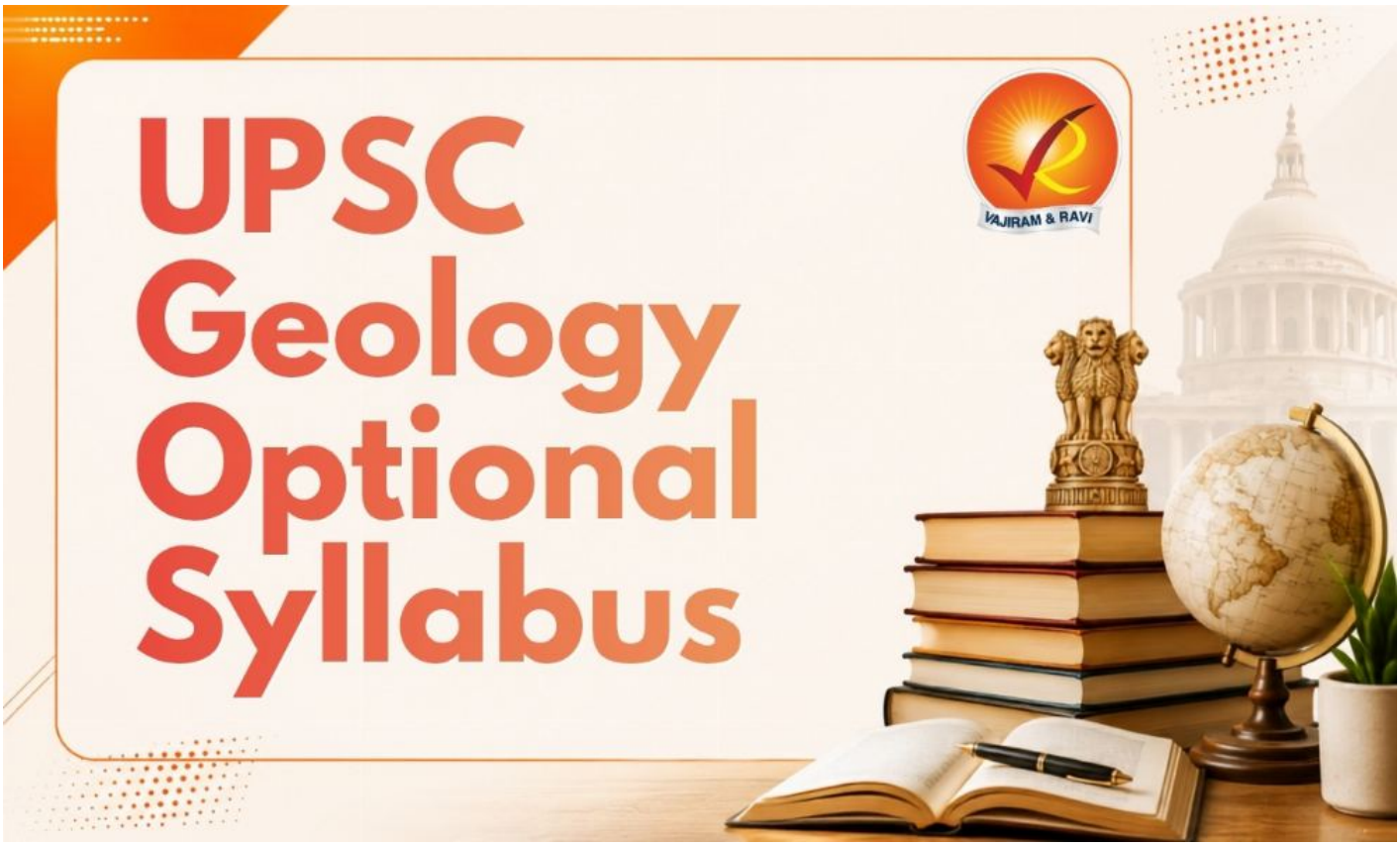
UPSC Geology Optional Syllabus 2026 for CSE Mains Paper 1 and 2

August 1, 2026 • vajiramandravi.com



The expansive UPSC Geology Optional Syllabus encompasses the Earth's evolution, structure, features and processes that shape its surface and interior. The Geology optional syllabus provides a comprehensive understanding of geology to analyse the Earth system and apply concepts towards human civilisation.

Core areas include **Physical Geology** like the planetary system, volcanism, earthquakes, weathering, erosion, sedimentation and physiography. **Structural Geology syllabus** covers primary and secondary structures, stress-strain relationships and field mapping techniques. **Economic Geology** deals with mineral deposits, coal, petroleum and atomic minerals. Palaeontology, Indian Stratigraphy, Hydrogeology and Engineering Geology focus on fossils, rock distribution, groundwater and geological aspects of human infrastructure.

What is the UPSC Geology Optional Syllabus?

Geology is one of the popular optional subjects opted for by UPSC aspirants in the Mains exam. It carries 500 marks overall, with two papers of 250 marks each.

- Though vast, the **UPSC Geology syllabus** has a logical flow and systematic approach. Questions often demand conceptual clarity and application of principles. Diagram-based questions are also common. Keeping up with current developments and discoveries is important.
- Geology is considered a moderately difficult optional by some as it requires a thorough understanding of concepts and processes spanning millions of years. A background in science can be helpful to grasp key principles.
- Preparation over 8-12 months through NCERT text books, reference books by subject experts, and previous years' papers is highly recommended. Strong focus should be on fundamentals, practice questions, and relating concepts to real-world examples. Overall, Geology provides a great option for those with an analytical bend of mind and an interest in earth sciences.

UPSC Geology Syllabus 2026 for Paper 1

Here is an overview of the UPSC Geology optional syllabus for Paper-1:

- **General Geology:**
    - The Solar System, Meteorites, Origin and interior of the Earth and age of Earth;
    - Volcanoes- causes and products, Volcanic belts;
    - Earthquakes-causes, effects, Seismic zones of India;
    - Island arcs, trenches and mid-ocean ridges;
    - Continental drifts;
    - Seafloor spreading, Plate tectonics;
    - Isostasy.
- **Geomorphology and Remote Sensing:**
    - Basic concepts of geomorphology;
    - Weathering and soil formations;
    - Landforms, slopes and drainage;
    - Geomorphic cycles and their interpretation;
    - Morphology and its relation to structures and lithology;
    - Coastal geomorphology;
    - Applications of geomorphology in mineral prospecting, civil engineering;
    - Hydrology and environmental studies;
    - Geomorphology of Indian subcontinent.
    - Aerial photographs and their interpretation-merits and limitations;
    - The Electromagnetic spectrum;
    - Orbiting satellites and sensor systems;
    - Indian Remote Sensing Satellites;
    - Satellites data products;
    - Applications of remote sensing in geology;
    - The Geographic Information Systems (GIS) and Global Positioning System (GPS) - its applications.
- **Structural Geology:**

- Principles of geologic mapping and map reading, Projection diagrams, Stress and strain ellipsoid and stress-strain relationships of elastic, plastic and viscous materials;
- Strain markers in deformed rocks;
- The behaviour of minerals and rocks under deformation conditions;
- Folds and faults classification and mechanics;
- Structural analysis of folds, foliations, lineations, joints and faults, unconformities;
- The time relationship between crystallization and deformation.

- **Palaeontology:**
  - Species- definition and nomenclature;
  - Megafossils and Microfossils;
  - Modes of preservation of fossils;
  - Different kinds of microfossils;
  - Application of microfossils in correlation, petroleum exploration, paleoclimatic and paleoceanographic studies;
  - The evolutionary trend in Hominidae, Equidae and Proboscidae;
  - Siwalik fauna;
  - Gondwana flora and fauna and its importance;
  - Index fossils and their significance.
- **Indian Stratigraphy:**
  - Classification of stratigraphic sequences:
  - lithostratigraphic, biostratigraphic, chronostratigraphic and magnetostratigraphic and their interrelationships;
  - Distribution and classification of Precambrian rocks of India;
  - Study of stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to fauna, flora and economic importance;
  - Major boundary problems- Cambrian/Precambrian, Permian/Triassic, Cretaceous/Tertiary and Pliocene/Pleistocene;
  - Study of climatic conditions, palaeogeography and igneous activity in the Indian subcontinent in the geological past;
  - Tectonic framework of India;
  - Evolution of the Himalayas.
- **Hydrogeology and Engineering Geology:**
  - Hydrologic cycle and genetic classification of water;
  - Movement of subsurface water;
  - Springs; Porosity, permeability, hydraulic conductivity, transmissivity and storage coefficient, classification of aquifers;
  - Water-bearing characteristics of rocks;
  - Ground-water chemistry;
  - Saltwater intrusion; Types of wells;
  - Drainage basin morphometry;
  - Exploration for groundwater;

- Groundwater recharge;
- Problems and management of groundwater;
- Rainwater harvesting;
- Engineering properties of rocks;
- Geological investigations for dams, tunnels highways, railways and bridges;
- Rock as a construction material;
- Landslides-causes, prevention and rehabilitation;
- Earthquake-resistant structures.

UPSC Geology Optional Syllabus- Paper 2

Here is an overview of the Geology optional syllabus for UPSC Paper-2:

- **Mineralogy:**
  - Classification of crystals into systems and classes of symmetry;
  - The international system of crystallographic notation;
  - Use of projection diagrams to represent crystal symmetry;
  - Elements of X-ray crystallography.
  - Physical and chemical characters of rock-forming silicate mineral groups;
  - Structural classification of silicates;
  - Common minerals of igneous and metamorphic rocks;
  - Minerals of the carbonate, phosphate, sulphide and halide groups;
  - Clay minerals.
  - Optical properties of common rock-forming minerals;
  - Pleochroism, extinction angle, double refraction, birefringence, twinning and dispersion in minerals.
- **Igneous and Metamorphic Petrology:**
  - Generation and crystallization of magmas;
  - Crystallization of albite-anorthite, diopside-anorthite and diopside-wollastonite-silica systems;
  - Bowen’s Reaction Principle;
  - Magmatic differentiation and assimilation;
  - Petrogenetic significance of the textures and structures of igneous rocks;
  - Petrography and petrogenesis of granite, syenite, diorite, basic and ultrabasic groups, charnockite, anorthosite and alkaline rocks;
  - Carbonatites; Deccan volcanic province.
  - Types and agents of metamorphism;
  - Metamorphic grades and zones;
  - Phase rule;
  - Facies of regional and contact metamorphism;
  - ACF and AKF diagrams;
  - Textures and structures of metamorphic rocks;
  - Metamorphism of arenaceous, argillaceous and basic rocks;
  - Minerals assemblages Retrograde metamorphism;

- Metasomatism and granitisation, migmatites, Granulite terrains of India.

- **Sedimentary Petrology:**
  - Sediments and Sedimentary rocks:
  - Processes of formation;
  - diagenesis and lithification;
  - Clastic and non-clastic rocks their classification, petrography and depositional environment;
  - Sedimentary facies and provenance;
  - Sedimentary structures and their significance;
  - Heavy minerals and their significance;
  - Sedimentary basins of India.
- **Economic Geology:**
  - Ore, ore minerals and gangue, the tenor of ore, classification of ore deposits;
  - Process of formation of minerals deposits;
  - Controls of ore localization;
  - Ore textures and structures;
  - Metallogenic epochs and provinces;
  - Geology of the important Indian deposits of aluminium, chromium, copper, gold, iron, lead-zinc, manganese, titanium, uranium and thorium and industrial minerals;
  - Deposits of coal and petroleum in India;
  - National Mineral Policy;
  - Conservation and utilization of mineral resources;
  - Marine mineral resources and Law of Sea.
- **Mining Geology:**
  - Methods of prospecting-geological, geophysical, geochemical and geobotanical;
  - Techniques of sampling;
  - Estimation of reserves or ore;
  - Methods of exploration and mining metallic ores, industrial minerals, marine mineral resources and building stones;
  - Mineral beneficiation and ore dressing.
- **Geochemistry and Environmental Geology:**
  - Cosmic abundance of elements;
  - Composition of the planets and meteorites;
  - Structure and composition of Earth and distribution of elements;
  - Trace elements;
  - Elements of crystal chemistry, types of chemical bonds, coordination number;
  - Isomorphism and polymorphism;
  - Elementary thermodynamics.
  - Natural hazards-floods, mass wasting, coastal hazards, earthquakes and volcanic activity and mitigation;
  - Environmental impact of urbanisation, mining, industrial and radioactive waste disposal, use of fertilisers, dumping of mine waste and fly ash;

- Pollution of ground and surface water, marine pollution;
- Environment protection - legislative measures in India;
- Sea level changes: causes and impact.

UPSC Geology Optional Syllabus PDF

Aspirants should keep a copy of the UPSC Geology Optional Syllabus handy during preparation to ensure all topics are covered. The PDF below outlines the syllabus in detail, including sub-topics, to help candidates plan their study effectively. Use it as a checklist to organise and focus your preparation.

Download: UPSC Geology Syllabus PDF

How to Prepare UPSC Geology Optional Syllabus?

The UPSC Geology syllabus is vast, so it focuses on major topics like Physical Geology, Structural Geology, Stratigraphy, Economic Geology, etc. Understand the paper format - there are two papers, each 3 hours long with 250 marks.

Here are some tips to effectively prepare the UPSC Geology optional syllabus:

- **Understand the Syllabus:** Start with an overview of the syllabus and UPSC previous year question papers to identify important topics and the exam pattern.
- **Select the Right Study Material:** Refer to standard textbooks prescribed by UPSC, like those by A. Holmes and S.K. Garg, to build your fundamentals. Make chapter-wise notes.
- **Stay Updated:** Read geology newsletters, journals, and science magazine articles regularly for current developments.
- **Solve Previous Years' Papers:** Solve the past 10-15 years of UPSC geology papers thoroughly. Observe the topic weightage and nature of the questions asked.
- Focus more time on your weaker areas. Physical geology and Indian stratigraphy usually need more attention.
- **Practice Diagrams and Case Studies:** Practice drawing neat diagrams, sections and labelling. UPSC often asks candidates to illustrate concepts through sketches.
- **Join a Test Series:** Take mock tests every 2-3 months to assess preparedness. Appear for GS prelims as well to build exam temperament.
- **Revision and Smart Learning:** Revise efficiently; summarise formulae, principles, and mnemonics for quick recall. Prefer analytical, diagram-based reference books for revision over descriptive textbooks.
- **Time Management:** Stay consistent and motivated over your preparation journey of 8-12 months by avoiding distractions is key to finishing the vast syllabus.

With a strategic approach and diligent effort, you can master this highly rewarding option.

Important Topics in UPSC Geology Optional Syllabus

Here is a list of important topics in the UPSC Geology syllabus for Paper 1 and Paper 2 from an exam point of view:

- **General Geology:**
    - Earth as a planet: Size, shape, rotation, and internal structure.
    - Earth's major internal and external processes.
    - Geological time scale.
    - Minerals and rocks: Classification, formation, and identification.
- **Geomorphology:**
    - Landforms and their evolution.
    - Plate tectonics and its impact on landforms.
    - Weathering, erosion, and deposition.
    - Fluvial, aeolian, glacial, and coastal processes.
- **Structural Geology:**
    - Stress and strain.
    - Fold and fault structures.
    - Unconformities.
    - Geological maps and cross-sections.
- **Paleontology:**
    - Fossils and their significance.
    - Principles of paleontology.
    - Evolution of life on Earth.
- **Stratigraphy:**
    - Principles of stratigraphy.
    - Classification and correlation of rock strata.
    - Stratigraphic nomenclature.
- **Mineralogy:**
    - Crystallography.
    - Physical and optical properties of minerals.
    - Classification of minerals.
- **Igneous and Metamorphic Petrology:**
    - Origin and classification of igneous rocks.
    - Types of volcanoes.
    - Metamorphism and metamorphic rocks.
- **Sedimentary Petrology:**
    - Sedimentary processes and environments.
    - Types of sedimentary rocks.
    - Diagenesis and sedimentary structures.
- **Economic Geology:**
    - Mineral resources of India and the world.
    - Ore genesis and exploration techniques.
    - Environmental issues related to mining.
- **Mining Geology:**
    - Methods of mining.

    - Mineral beneficiation and metallurgy.
    - Coal and petroleum geology.
- **Hydrogeology:**
    - Groundwater occurrence and movement.
    - Aquifers and aquitards.
    - Groundwater exploration and management.
- **Engineering Geology:**
    - Geological factors in construction and engineering projects.
    - Landslides and their prevention.
    - Geological hazards.
- **Environmental Geology:**
    - Natural hazards and disasters.
    - Environmental impact assessment.
    - Geology and sustainable development.
- **Remote Sensing and GIS in Geology:**
    - Applications of remote sensing and GIS in geological studies.
    - Interpretation of satellite imagery and aerial photographs.
- **Geological Field Work:**
    - Field techniques and mapping.
    - Geological field reports.
- **Geophysical Exploration Methods:**
    - Principles and applications of geophysical methods in geology.
    - Seismic surveys, gravity, and magnetic methods.
- **Geochemistry:**
    - Principles of geochemistry.
    - Geochemical analysis and interpretation

Booklist for Geology Optional for UPSC

The suggested books below cover the UPSC Geology syllabus, but it is not necessary to read each book comprehensively. Focus on reading the specific chapters and topics in each book that are relevant to the UPSC exam. Be strategic in selecting which portions to study rather than trying to get through every page of these reference books.

Topic	Recommended Books
Mineralogy and Petrology	- Rutley's Elements of Mineralogy, Petrology by Huang, Igneous and Metamorphic Petrology by Winter
Structural Geology	- Structural Geology by Billings, Structural Geology by Ghosh
Stratigraphy	- Indian Stratigraphy by Datta, Stratigraphy and Geology of India by Pankaj Srivastava

Paleontology	- Elements of Paleontology by Rhona Black, Paleontology by Jain and Anantharaman
Hydrogeology	- Groundwater Hydrology by Todd, Hydrogeology by Karanth
Geomorphology	- Geomorphology by Ravindran, Geomorphology by Thornbury
Economic Geology	- Economic Geology by U. Prasad, Ore Deposits of India by Roy Chaudhary
Geophysics	- Principles of Geophysics by KK Kanasewich, Applied Geophysics by P. Kearney
Engineering Geology	- Engineering Geology by Parbin Singh, Engineering Geology by Bell

The key is to combine selective reading with solving previous years' question papers to identify and prioritize the most important syllabus areas to maximize your preparation efficiency. Other Sources to follow to cover the UPSC Geology syllabus effectively:

- **Journals:**
  - Geological Society of India Journal
  - Journal of the Geological Society of India
  - Current Science
- **Newsletters:**
  - IIRS Outreach Newsletter
  - GSI Newsletter
  - IUGS E-Bulletin
- **Magazines:**
  - Down to Earth
  - Science Reporter
  - GEO India
- **Websites:**
  - Geological Survey of India website
  - Ministry of Mines website
  - Indian Institute of Remote Sensing website

Other Related UPSC Optional Syllabus		
UPSC Commerce Optional Syllabus	**UPSC Geography Optional Syllabus**	**UPSC Geology Optional Syllabus**
UPSC History Optional Syllabus	**UPSC Law Optional Syllabus**	**UPSC Maths Optional Syllabus**
UPSC Medical Science Optional Syllabus	**UPSC Philosophy Optional Syllabus**	**UPSC Physics Optional Syllabus**

Other Related UPSC Optional Syllabus		
UPSC PSIR Optional Syllabus	UPSC Psychology Optional Syllabus	UPSC Sociology Optional Syllabus
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UPSC Anthropology Optional Syllabus	UPSC Botany Optional Syllabus	UPSC Chemistry Optional Syllabus
UPSC Civil Engineering Optional Syllabus	UPSC Management Optional Syllabus	UPSC Mechanical Engineering Optional Syllabus
UPSC Public Administration Optional Syllabus	UPSC Statistics Optional Syllabus	UPSC Electrical Engineering Optional Syllabus
UPSC Animal Husbandry & Veterinary Science Optional Syllabus		

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