

NATIONAL EDUCATION POLICY-2020

PROPOSED PROGRAMME AND COURSE SPECIFIC OUTCOMES OF UNDERGRADUATE COURSE IN GEOLOGY

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BASIC ELIGIBILITY CRITERIA FOR PROGRAMME:

The student who has passed intermediate Science with Mathematics/Biology group or equivalent examination can opt for geology in **Six Semester B.Sc. programme** (undergraduate level). He/she should have keen interest in understanding the earth forming processes through time and aptitude for geoscientific study and research. Geology as major is decent choice to opt for and give a wide range of career opportunity in the fields of geoscience, disaster management, natural resource assessment and management, civil engineering construction projects, natural environment conservation, and allied fields can choose the offered courses in geology.

PROGRAMME INTRODUCTION

Geology is an ever advancing and most popular branch of pure and applied science amongst the students having keen interest and curiosity in understanding the origin, evolution, nature, composition, structure and processes of the Earth and its environs through time. The identification of minerals, rocks, and fossils provide insights into the age, composition, structure, and paleoenvironment of the Earth, and life that thrived on it through the geological ages. This leads to understanding the physical processes of the Earth's spatio-temporal evolution and the availability of its natural resources and reserves. A thorough knowledge on various domains of geology is, thus, immensely useful in not only enriching our knowledge about various physical and historical aspects of the Earth's evolution and dynamics, but also in judiciously utilizing its precious natural resources as well as efficiently preventing or mitigating disasters that could be caused as a result of the Earth's powerful endogenic and exogenic processes. The programme offers essentially the fundamental and advanced knowledge and technical skills on various domains of geology. Students would study core and applied aspects of, and recent technological advances in the subject field. The curriculum of the programme is designed in such a stepwise manner that the student can derive benefit at any stage of the programme even if the entire course is not completed; it begins with basic essential knowledge and gradually covers advanced aspects of the subject. At the end of every academic year, the student would have good knowledge of some basic and applied aspects of the subject, and this will keep on growing as the students proceeds further with the subject course. At a later stage of the course, the curriculum provides the student with an opportunity of carrying out field and/or laboratory based project work leading to a dissertation in a specialized domain of geology, which is actually a training of making a professional geologist competent in generating, analyzing, and synthesizing the data, to resolve geoscientific problems.

COURSE OUTCOMES (COs)

The curricula of the subject of geology are designed keeping in view the following programme outcomes:

- Enabling the students to understand the age, composition, structure, processes, and evolutionary history of the Earth.
- Enabling the students to identify, locate, explore, judiciously exploit, and manage various Earth resources like minerals, fossil fuel and natural gas, coal, building stones, weathered crust and soils, underground and surface water etc.
- Enabling the students to understand and assess the potential of natural processes in causing hazards and disasters.
- Enabling the students to understand such geological conditions that make the terrain prone to natural and anthropogenic hazards.
- Enabling the students to assess the suitability of terrain for various civil engineering constructions such as dams, reservoirs, bridges, tunnels, roads, railway lines, cable cars, and buildings etc.
- Enabling the students to formulate and execute guidelines for safe developmental activities in diverse geological terrains.
- Motivating the students to take up higher studies and research to bringing out new knowledge yet to be understood the geological aspects of the Earth.
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List of Semester-wise Titles of the Papers in Geology (Year wise and Six Semester)						
Year	Sem.	Course Code	Paper Title	Theory/ Practical	Credits	Teaching hrs
CERTIFICATE COURSE IN SCIENCE						
FIRST YEAR	I		Physical & Structural Geology	Theory	04	60
			Physical & Structural Geology + Field work)	Practical	02	60
	II		Elements of Mineralogy & Gemology	Theory	04	60
			Mineralogy & Gemology	Practical	02	60
DIPLOMA COURSE IN SCIENCE						
SECOND YEAR	III		Petrology	Theory	04	60
			Petrology + Field work	Practical	02	60
	IV		Palaeontology	Theory	04	60
			Practical (Palaeontology)	Practical	02	60
BACHELOR OF SCIENCE						
THIRD YEAR	V		Economic Geology & Mineral Exploration	Theory	04	60
			Geohydrology & Environment Geology	Theory	04	60
			Economic & Exploration Geology + Field work	Practical	02	60
	VI		Remote Sensing & Elementary Engineering Geology	Theory	04	60
			Stratigraphy	Theory	04	60
			Remote Sensing + Stratigraphy	Practical	02	60

Programme specific outcomes (PSOs):

UG I Year / Certificate Course in Science

Programme Specific Prerequisites: To acquire a *Certificate in Science*, with geology as one of the major subjects, a student should have passed 10+2 with science background having either Mathematics/Biology group or equivalent subjects. The candidate may have keen interest in understanding the earth forming processes and its evolution through time.

Programme Specific outcomes: This programme pertains to basic and applied knowledge on the essential components of geology, in which the students will know the broad physical aspects of the earth, and learn to identify different minerals and gemstones. This programme will impart knowledge on diverse branches of the subject, as well as endogenic and exogenic processes, and geomorphic features of the earth. At the end of the programme the student will have basic knowledge about the rock forming minerals, characteristics properties of gemstones, and the subject domain of geology that are required for further academic progression as well as preparation for competitive examinations.

UG II Year/ Diploma Course in Science

Programme Specific Prerequisites: To acquire *Diploma in Science*, with geology as one of the major subjects, a student should have obtained Certificate Course in Science from any recognized university.

Programme Specific outcomes: This programme provides broad understanding on various physical and historical aspects of the earth. Having understood the broad physical aspects of the Earth, its constituents, and rock-forming minerals in the two semester *Certificate of Science* programme, the students will gain knowledge on rock forming processes in one semester, and faunal and floral life of the geological past in another semester. The programme will enable the students to identifying different rocks and rock forming processes (petrogenesis) on the basis of minerals, structure, composition, megascopic, and microscopic characters by observing rocks at outcrops, in hand specimens and thin sections. It will also enable them to identify different types of animal and plant fossils, and to understand the origin and evolution of life on the earth.

UG III Year/ Bachelor of Science

Programme Specific Prerequisites: To acquire a *Bachelor of Science* degree, with geology as one of the major subjects, a student should have obtained Diploma Course in Science from any recognized university. Student

should have a learning aptitude towards rocks and ores.

Programme Specific outcomes: Having understood basic physical and historical aspects of the earth as *Diploma in Science* programme, the students of this programme will gain added knowledge on earth resources, environment, geological controls on the safety of civil engineering construction, and evolution of the earth through time. They will also learn the basics of the fast growing remote sensing technology, and its application potential in geological investigations. The programme will enable the students to understand such aspects of the earth as its composition, structure, natural resources, terrain and life evolution through time and space, geological process leading to environmental degradation and hazards, and endangering the safety of civil engineering constructions, as also the techniques of earth resource exploration and using remote sensing technique in geological investigations.

COURSE SPECIFIC OUTCOMES

Semester I

Theory Paper I: Physical & Structural Geology

Course outcome: After successful completion of this course students will understand the origin of solar system, and dynamics of earth's surface and interiors, plate tectonic processes, seismicity, and volcanism. They will be enhanced by the knowledge regarding formation of different landforms and the physical, chemical and biological processes operating upon the earth. After completing this course they will be able to recognize and interpret the geological structures formed as a result of deformation.

Practical: Physical and structural Geology and Field work

Course outcome: Student can understand and identify various geomorphic processes and will be able to recognize different types of fold and faults. They will also be able to read topographical maps of the Survey of India. Student can also acquire knowledge about various geological problems through field training and will be capable in report writing.

Semester II

Paper I: Elements of Mineralogy & Gemology

Course outcome: After completing this course, student will gain basic and fundamental knowledge about the various mineral groups with regard to their physical and optical properties along with an idea about crystal systems, their symmetry elements and notation systems. Apart from this, basic knowledge about the instruments such as physical tools and polarizing microscope etc. will also be imparted. Basic knowledge about gemstones

will be given to train the students in recognizing and using the semiprecious and precious minerals and gemstones,

Practical: Mineralogy and Gemology:

Course outcome: Student can understand and identify various minerals with their properties in field as well as in microscope. They will also able to understand about gem stones, which make them a professional in geology and newly emerging medicinal gemology field of therapy.

Semester III

Paper I: Petrology

Course outcome: The prime aim of this course is to characterize, classify, and deduce the genesis of individual rock, and rocks in association making a rock suite or complex or succession. Students will characterize, identify and name different types of rocks in the field and in hand-specimens, and rock-thin sections, and finally they will propose the rock-forming processes (petrogenesis). The most common criteria are structure, texture, mineral assemblage and modes present in a particular rock that are examined at megascopic and microscopic levels.

Practical: Petrology and field work:

Course outcome: Petrology: Student will be able to understand about formation of various rock types. Students will characterize, identify and name different types of rocks in the field and in hand-specimens, and rock-thin sections, and finally they will propose the rock-forming processes (petrogenesis). They will also able to understand various common structures in igneous, metamorphic and sedimentary rocks using through field training.

Semester IV

Paper I: Paleontology:

Course outcome: This course intends to acquaint the students about origin and evolution of life through geological time and the major evolutionary breakthroughs, and to correlate the evolutionary history with other synchronous geological events. Also they will know the causes of major events of mass extinctions in geological past including the glaciations periods

Practical: Paleontology:

Course outcome: It would add to their knowledge regarding the basic concept of paleontology using mode and

methods of fossil preservation and species identification, thereafter suggesting the organic evolutionary path and paleoenvironment..

Semester V

Paper I: Economic Geology & Mineral Exploration

Course outcome: The course is intended to impart basic knowledge about the occurrence and distribution of metallic and non-metallic ores and energy resources in India, and to understand ore-forming processes. The acquired knowledge of ore-formation indeed paved the way of developing methods of ore prospecting, exploration, mining, and beneficiation of economic deposits. This course will surely help the students for opting carrier in the field of mineral prospection, exploration, and mining industry.

Paper II: Geohydrology & Environment Geology

Course outcome: This course has a direct implication on understanding and resolving the societal issues particularly dealing with groundwater and environment. They will be enlightened as to how we the humans are part of our surrounding natural environment and how we should work for its preservation and sustainable development. This course will help making a responsible citizen and professional with regard to understanding our valuable land and water resources, and their utilization in more scientific and sustainable manner and further managing geohazards

Practical: Economic & Exploration Geology + Field work

Course outcome: Students can acquire the elementary knowledge of geological and geophysical prospecting methods. The acquired knowledge of prospecting, exploration, mining, and beneficiation of economic deposits can boost the carrier of students in the field of oil and mining industries. The students will gain a better knowledge regarding groundwater occurring in the form of aquifers and surface waters, and the laws governing the recharge, storage, movement and exploitation.

Semester VI

Paper I: Remote sensing & Elementary Engineering Geology

Course outcome: This course introduces recent technique of remote sensing that has wide application potential in several fields of surveying such as geological, geographical, agricultural, forestry etc. In the present programme, the students will know about the interpretation of aerial remote sensing and its application potential in geological investigations. The students will also be introduced to geological aspects that must be taken care of for any safe and stable geo-engineering activity such as construction, mining, and environmental

conservation.

Paper II: Stratigraphy:

Course outcome: After completion of this course students will be able to understand fundamentals of stratigraphy and the geological time scale. They will now be able to correlate and understand about the various age group rocks occurring in India and the boundaries separating them. It will enable them to understand the evolution of terranes through time and space.

Practical: Remote sensing and Stratigraphy :

Course outcome:

Using various satellite data and imageries, the students will be able to understand and interpret the aerial photographs and disseminate its knowledge towards application potential in geological investigations.

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