



**जय नारायण व्यासविश्वविद्यालय**  
**JAI NARAIN VYAS UNIVERSITY, JODHPUR**  
**FACULTY OF SCIENCE**  
**NEW CAMPUS**

**B.Sc. I and II Semester NEP based Syllabus for Academic Year 2023-24**

**B. Sc. I Semester, Level 4.5, Geology 2023-24**

Theory Paper GEO5001T: Earth System Science 100 Marks Credits 4

Practical - GEO5001P : Earth System Science Practical 100 Marks Credits 2

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Total 200 Marks

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Duration of each Theory paper Examination 3 Hrs.

Duration of Practical Examination 3 Hrs.

**Discipline Centric Core Course**  
**GEO5001T – Earth System Science**

**(Credits 4; 60 Hrs; M.M. 100 = 70 End Sem. + 30 Sessional)**

**Course Objective:**

1. Preliminary acquaintance about Geology.
2. Introductory knowledge of Earth. Its inorganic and organic constituent and landscaping processes and the manifested elements.

**Course Outcomes:** The course helps the students to understand:

1. About the various aspects of the Earth, its internal and external features.
2. Geological time scale, origin of landscapes. Stress induced features.

**Course Outcomes:**

The students get an insight to study the cause, effects, and consequences that any geomorphic area shows

**Unit I**

Geology and its branches, scopes and applications. Introduction to basic tenets of origin of the Universe, the solar system. Earth in the Solar System: origin, size, shape, mass, density, rotational and revolution parameters. Keplers laws of planetary motion. Chemical composition of the Earth. Basic concepts of seismology and Internal structure of the Earth - crust, mantle and core. Earth's thermal structure; Internal heat and Radioactivity of the Earth; Earth's gravity and magnetic field. Formation of hydrosphere, atmosphere and biosphere. Age of the Earth. Concept of Geoid and spheroid.

**Unit II**

Continental Drift Theory, Concept of Plate Tectonics. Nature and types of plates. Causes and rate of plate movement. Sea floor spreading and plate tectonics. Evidences of sea floor spreading. Application of theory of plate tectonics in Geology to explain Mountains, Earthquake belts, and Island arcs. Origin of Oceans, Continents and Mountains. Concept and application of palaeomagnetism. Define Hypsography and Topography. Principal of Uniformitarianism.

**Unit III**

Origin and distribution of Island arcs. Concept and theories of Isostasy; Geomorphic agents & processes; Weathering – their types: erosional processes; Difference between Weathering and Erosion. Soil and soil profile. Geological work of rivers and fluvial landforms. Geological work of wind and aeolian landforms.

**Unit IV**

Geological work of Glaciers and glacial landforms, Geological work of Groundwater; Karst topography. Geological work of Ocean; Physical features of Oceans and Coasts. Deep Sea trenches and Mid-oceanic Ridges. Abyssal plain.

**Unit V**

Earthquakes: Their causes, effects and distribution. Earthquake waves. Measurement of Earthquakes. Volcanoes: Types, Volcanic landforms and distribution. Toposheets or topographic maps, representation of landforms by various methods. Physical division of India, and their characteristics. Geomorphic Divisions of Rajasthan and their characteristics. River basins of India and Rajasthan.

**Essential Reading:**

- 1- Thornbury W. D., (1958) Principles of Geomorphology John Wiley and Sons.
- 2- Mukherjee P. K., (1991) A Text Book of Geology CBS Publisher and Dist., New Delhi.
- 3- Homes A., (1993) Principle of Physical Geology 4<sup>th</sup> Ed., Chapman and Hall, London.
- 4- Datta A. K., An introduction to Physical Geology –Dastane Ram.
- 5- Mahapatra, G. B. : Text book of Physical Geology. CBS
- 6- Mukul Ghosh. Bhautik Bhuvigyan

**Suggested Reading:**

1. Lahee, (1961) Field Geology Frederic Henry, Mc-Graw Hill Book Comp., London, N. York.
2. E-content on the website:cec.gov.in

**Discipline Centric Core Course**  
**GEO5001P – Earth System Science Practical**  
**(Credits 2; 60 Hrs; M.M. 100 = 70 End Sem. + 30 sessional)**

- Draw the Physical divisions of India and Rajasthan in respective map.
- Draw distribution of earthquakes and major mountains in map of the world.
- Draw landforms of rivers, wind, glaciers and volcanoes.
- Study of physical models showing geomorphic features.
- Configuration and Numbering of topographic maps on various scales.
- Interpretation of various geomorphic landforms and drainage patterns on toposheet.
- Map exercise related to plotting of major mountain ranges, lakes and rivers of India & seismic data on map of India.

**B. Sc. II Semester, Level 4.5, Geology 2023-24**

Theory Paper- GEO5002T: Mineral Science 100 Marks Credits 4

Practical- GEO5002P: Mineral Science Practical 100 Marks Credits 2

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 Total 200 Marks
 

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Duration of each Theory paper Examination 3 Hrs.

Duration of Practical Examination 3 Hrs.

**Discipline Centric Core Course  
GEO5002T – Mineral Science****(Credits 4; 60 Hrs; M.M. 100 = 70 End Sem. + 30 Sessional)****Learning Objective of the Course**

The course for the Crystallography and Mineralogy is running with a view to provide a glance to different crystals and rock forming minerals, processes, structure and others physicochemical properties of minerals and its significance.

**Unit I**

Crystallography: Definition of Crystal, Elementary ideas about Crystal Structure, Crystal faces, edges and Interfacial angles, Solid angle, Zone and Crystal Forms. Crystallographic axes and axial angles. Crystal Symmetry Elements. Parameters and Indices of Crystal Notations, Twinning in crystals. Introduction to Unit cells and Space Lattice.

**Unit II**

Classification of Crystals into seven systems. Study of Symmetry Elements and Crystal forms of normal classes of all Crystal Systems - Cubic System, Tetragonal System, Hexagonal System, Trigonal System, Orthorhombic System, Monoclinic System and Triclinic System.

**Unit III**

What is mineral? Principles of classification of the minerals. Chemical bonding, Silicate structures, Concept of Isomorphism, Polymorphism, Pseudomorphism, Solid solution and Exsolution. Physical Properties of Minerals: Forms, Colour, Streak, Lusture, Cleavage, Fracture, and Hardness. Specific Gravity, Electrical, Magnetic and Radioactive properties of minerals. Chemical composition, physical and optical properties of the ortho / nesosilicate group of mineral: Olivine, Garnet, and Aluminosilicate group of minerals (Kyanite, Sillimanite and Andalusite) and Zircon.

**Unit IV**

Ordinary and polarized light, isotropic and anisotropic minerals, their wave surfaces and wave fronts, Reflection and refraction of light, Refractive index, critical angle, total internal reflection and Becke's effect, Double refraction, Nicol Prism - its construction and working. Optical properties under microscope: Petrological microscope - its parts and functioning, Optical properties of minerals- twinkling, Relief, birefringence and pleochroism, Interference Colour, Extinction and its types, extinction angle and twinning. Introduction to Uniaxial and biaxial characters of minerals. Study of optical properties of Muscovite, Biotite, Quartz, Orthoclase, Microcline, Plagioclase, Olivine, Garnet, Augite and Hornblende.

**Unit V**

Chemical composition, physical and optical properties of Sorosilicate & Cyclosilicate group of minerals: Epidote, Tourmaline etc. Chemical composition, physical and optical properties of the inosilicate group of minerals: Pyroxene, and amphibole. Chemical composition, Physical and optical properties of the phyllosilicates group of minerals: Mica (only Muscovite, & Biotite) and Chlorite,. Chemical composition, physical and optical properties of the tectosilicate group of minerals: Silica, Feldspar and Feldspathoids (Nepheline).

**Discipline Centric Core Course  
GEO5002P – Mineral Science Practical**

**(Credits 2; 60 Hrs; M.M. 100 = 70 End Sem. + 30 sessional)**

**Study of physical properties of the rock forming minerals.**

- Olivine, Garnet, Aluminosilicate group of minerals (Kyanite, Sillimanite and Andalusite) and Zircon. Garnet, Epidote, Olivine, Tourmaline, Augite, and Hornblende. Chlorite, Biotite and Muscovite. Silica & its varieties, Feldspar (Orthoclase, Microcline, Plagioclase), Nepheline. Talc, Calcite, Apatite, Barite, Asbestos, Corundum and Beryl.
- Occurrence and distribution of Minerals in India.
- Study of symmetry elements in crystal models.
- Study of Fundamental forms of normal classes of all crystal systems.
- Study of the optical properties of important rock forming minerals using polarizing microscope: Muscovite, Biotite, Quartz, Orthoclase, Microcline, Plagioclase, Calcite, Olivine, Garnet, Augite and Hornblende.

**Essential Reading:**

1. Read, H.H. (1962) Rutley's **Elements of Mineralogy** Reprint CBS Pub. & Dist., New Delhi
2. Ford W. E., (2006) Dana's Text Book of **Mineralogy** CBS Pub. & Dist., New Delhi.
3. R.S. Sharma and Anurag Sharma, 2013. Crystallography and Mineralogy – concept and methods. Geological Society of India, Bangalore.
4. Dexter Perkins, 2014. Mineralogy. Pearson New International.
5. Jais B.C. Khanij evam Crystal Vigyan. Madhya Pradesh Hindi Granth Acadami.

**Suggested Reading:**

1. Alexander P. O. (2008), Handbook of **Minerals, Crystals, Rocks and Ores**, New Age India.
2. Thomas, H. (2018) MOOC on Crystallography & Mineralogy offered by Prof. Harel Thomas
3. E-content on the website: cec.gov.in