GOA UNIVERSITY
Taleigao Plateau

SYLLABUS FOR GOA UNIVERSITY ADMISSIONS RANKING TEST (GU-ART) IN EARTH SCIENCE (GEOLOGY)

CRYSTALLOGRAPHY, MINERALOGY, PHYSICAL GEOLOGY

Elemental and Oxide composition of the Earth's Crust; Definition of a crystal; Three types of Atomic Bonds; Crystallographic axes and Crystal system; Symmetry in crystals: Planes, Axes and Centre of Symmetry; Important and abundant mineral groups: Silicates, Sulfides, Sulphates, Carbonates, Oxides, Halides, Native metals; Physical Properties of Minerals; Classification of Silicates according to Structure; Scope and Importance of Physical Geology; Major Relief features of the Earth, Characteristic features of Mountains, Plateaus, and Plains; Erosional and depositional features; Coral reef.

Crystallography- imperfections in crystals, interfacial angle. twinning, Geochemistry-classification of elements (Chalcophile etc). phase rule, phase components, Binary systems. Study of minerals with emphasis on mode of occurrence, chemical composition, paragenesis and origin of common rock forming silicate minerals, sulphides (Cu, Pb, Zn),oxides, hydroxides (Fe,Mn,Cr,Ti) hydroxides of aluminium (Bauxite), metamorphic minerals (garnet, staurolite), chlorite, andalusite-kyanite-sillimanite). Geothermometers.

EARTH'S DYNAMICS and STRUCTURAL GEOLOGY

Origin of Solar System (Nebular Concept) and formation of a layered Earth; Earth's interior: Lithosphere, Asthenosphere and Convection currents; Shape and Size of Earth; the top-to-bottom (atmosphere to core) structure of the Earth.

Earth's Gravity; Isostasy [Airy's and Pratt's hypothesis]; Earth's Magnetism; Introduction to Plate Tectonics; Plate margins and associated major activities; Orogenic and epeirogenic movements. Internal heat of the earth and its sources; Earthquakes: Seismic waves, Magnitude (Mercalli Scale), Intensity (Richter Scale), Determination of Epicenter (Circle of error), Types of Earthquakes (shallow, intermediate, deep); Tsunamis; Clinometer compass: construction, working and uses;

Outcrop patterns of Horizontal, Inclined and Vertical strata on various types of ground surfaces; Rule of 'V's'; Folds; Causes and types of folds; Joints; Faults: general characteristics, geometric classification and importance; Unconformities

IGNEOUS, SEDIMENTARY & METAMORPHIC PETROLOGY

Igneous rocks: Plutonic, Hypabyssal and Volcanic Types; Volcanic activity, Volcanic products, Types of volcanoes, Intrusive forms; Multiple and Composite intrusions; Textures; Classification of igneous rocks based on Colour Index, Grain size & Mineral composition; IUGS Classification of Saturated and Oversaturated Plutonic rocks; Bowen's reaction series;

Weathering of Rocks; Sedimentation and Diagenesis; Structures,Textures and composition, Classification based on Grain size and Mode of formation; Sedimentary environments.

Metamorphism: Agents, Types, Grades and Index Minerals; Metamorphism related to plate tectonics, Structures and Textures of metamorphic rocks; Classification based on types of metamorphism and composition; Nomenclature of metamorphic rocks.

PRINCIPLES OF STRATIGRAPHY AND PALAEONTOLOGY.

Introduction to, scope and importance of Stratigraphy; Principles of Stratigraphy: Law of uniformitarianism, Law of original horizontality, Law of order of superposition, Law of faunal succession, Law of cross-cutting relationship, Law of inclusions; Correlation and methods of correlation: Standard Stratigraphic Scale; Indian stratigraphic sequence; Time Units: - Era, Period, Epoch, Age, Phase; Chronostratigraphic Units: - Erathem, System, Series, Stage and Zone. Lithostratigraphic Units: - Group, Formation, Member and Bed. Age of the Earth; Radiometric Dating principles with suitable examples; Application in dating earth materials; Palaeogeographic configuration of the earth;

Physiographic subdivisions of India and their distinctive characters; Brief account of major geological formations of India and their economic mineral wealth.

Fossils- types. Condition of fossilization. Study of general characteristics, morphology, habitats and geological history of the following Phylla: Phylum Mollusca: Pelecypoda, Gastropoda, Cephalopoda (Classes Nautiloidea, Ammonoidea, Belemnoidea); Phylum Brachiopoda: Articulata, Inarticulata; Phylum Echinodermata: Echinoidea, Crinoidea; Phylum Arthropoda: Trilobita; Phylum Protozoa.

Geotectonics

Geographical and geological evidences pointing to the continental drift. Taylor's and Wegner's concepts of continental drift. Transform faults. Palaeomagnetic timescale. Age of the break-up of Pangea. Plate tectonics-lithospheric plates and types of plate margins. Geometrical aspect of plate-motion. Subduction zones.relation of volcanism to plate tectonics. Orogeny-location and internal structure of mountain chains. Geosynclines and evolution of orogenic belts, duration of orogenic cycles. Geochronology: measurement of Geologic time, Various radiometric methods-their application and limitations.

Environmental Geology

Ecological perspectives of environment. Biotic Communities. Anthropogenic changes in Ecosystem. Land use planning and natural hazards. Hydrological cycle and its components; Aquifer parameters; Water quality: parameters of water quality; physical, chemical and biological, major, minor and trace constituents, ISI standards for drinking water. Mining methods, hazards and environmental impact due to mining. Environmental Impact Assessment (EIA). Environmental Management in Mining (EMP). Utilisation and conservation of mineral resources. Estimation of ore reserves. Geotechnical Projects: the role of geologists. Dams and reservoirs: Foundation geology, seismicity and environmental impact. Tunnels.

REFERENCES:

1. A textbook of Geology by P. K. Mukherjee (World Press)
2. A Textbook of Engineering and General Geology (Seventh Ed) by Parbin Singh
3. Rutley's Elements of Mineralogy by H. H. Road (Twenty-sixth Ed) (CBS Publishers & distributors)
4. Dana's textbook of Mineralogy by W. E. Ford (Fourth Ed) 5. Holmes' Principles of Physical Geology by Arthur Holmes (Third Ed) (ELBS)
5. Holmes' Principles of Physical Geology edited by P. McL. D. Duff (ELBS)
6. Physical Geology by Charles C. Plummer and David McGeary (Fourth Ed) (Wm. C. Brown Publishers)
7. Physical Geology by C. W. Montgomery (Second Ed) (Wm C. Brown Publishers)
8. Understanding the Earth (Fourth Ed) by Press, Siever, Grotzinger & Jordan
9. The Changing Earth: Exploring Geology and Evolution (Third Ed) by Monroe & Wicanter
10. Understanding the Earth (Fourth Ed) by Press, Siever, Grotzinger & Jordan
11. The Changing Earth: Exploring Geology and Evolution (Third Ed) by Monroe & Wicanter
12. Holmes' Principles of Physical Geology by Arthur Holmes (Third Ed) (ELBS)
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14. Physical Geology by Charles C. Plummer and David McGeary (Fourth Ed) (Wm. C. Brown Publishers)
15. Physical Geology by C. W. Montgomery (Second Ed) (Wm C. Brown Publishers)
16. Structural Geology by M. P. Billings (Prentice Hall)
17. Elements of Structural Geology by E. S. Hills (Methuen)
18. The Changing Earth: Exploring Geology and Evolution (Third Ed) by Monroe & Wicanter
19. The Elements of Palaeontology by Rhona Black (Cambridge University Press, 1972)
20. Invertebrate Paleontology and Evolution by E.N.K.Clarkson.(Second Ed) (ELBS/Allen & Unwin)
21. Introduction to Invertebrate Palaeontology by Koregave
22. Simon & Schuster's Guide of Fossils by Paolo Arduini & Giorgio Teruzzi (Simon & Schuster Inc., New York)
23. Basic concepts of Historical Geology by E. W. Spencer (Oxford Hill)
24. Fundamentals of Historical Geology and Stratigraphy of India by Ravindrakumar (Wiley Eastern Ltd.)
25. Geology of India and Burma by M.S. Krishnan (Sixth Ed) (CBS)
26. Physical Geology by C. W. Montgomery (Second Ed) (Wm C. Brown Publishers)
27. Berry and Mason : Mineralogy,CBS Publ. and Distr. Deer W. A. Howie R.A. Zussman J. :Rock forming minerals John Wiley and Sons
28. Condie : Plate Tectonics and Crustal Evolution, Pergamon Press