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॥ अंतरी पेटवू ज्ञानज्योत ॥

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**NORTH MAHARASHTRA UNIVERSITY,
JALGAON.**

Syllabus for F.Y.B.Sc.

GEOLOGY.

(W.e.f. Acd. Yr. 2002 - 2003)

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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus for F.Y.B. Sc. GEOLOGY

(With effect from Acad. Yr. 2002 - 2003)

Scheme

Paper I : Mineralogy & Petrology

Paper II : General Geology & Palaeontology

Paper III : Practical

List of Books :

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|-------|---|-------------------------|
| i) | Rutley's Elements of Mineralogy | --By C.D. Gribble |
| ii) | Textbook of Mineralogy | --By J.D. Dana |
| iii) | Mineralogy for Students | --By Betty |
| iv) | Concepts in Geology | --By Kulkarni & Others |
| v) | Principles of Petrology | --By G.W. Tyrrell |
| vi) | Petrology-Igneous, Sedimentary, & Metamorphic | --By Best |
| vii) | Igneous, Metamorphic Petrology | --By Turner & Verhoogen |
| viii) | Sedimentary Rocks | --By Petijohn |
| ix) | General Geology | --By V. Radhakrishnan |
| x) | Invertebrate Paleontology | --By Woods |
| xi) | Principles of Paleontology | --By Raup & Stanley |
| xii) | Historical Geology | --By Wicander |
| xiii) | Fundamental of Invertebrate Palaeontology | --By Koregave |
| xiv) | Elements of Palaeontology | --By Babin |
| xv) | Stratigraphy | --BY Weller |

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PAPER-I
MINERALOGY.

		<u>(No. of Lectures)</u>
<u>Unit-I</u>	<u>Introduction</u>	(3)
	i) Definition & scope of Mineralogy ii) Minerals of the Earth iii) Mineral forming processes iv) Important types of chemical bonds in minerals	
<u>Unit-II</u>	<u>Mineral Identification</u>	(13)
	A) Physical Properties :	
	i) Color and Streak ii) Luster iii) Transparency and Translucency iv) Phosphorescence and Fluorescence v) Form vi) Hardness and Tenacity vii) Cleavage viii) Fracture ix) Magnetic Property x) Electrical Conductivity xi) Radioactivity xii) Specific Gravity: Pycnometer, Walker's Steelyard Balance.	
	B) Chemical Properties :	(2)
	i) Introduction to silicate structure; Definition and types	
<u>Unit-III</u>	<u>Classifications</u>	(2)
	i) Chemical classification based on Anions & Elements ii) Classification based on Industrial uses	
<u>Unit-IV</u>	<u>Rock forming Minerals :</u>	(5)
	i) Olivine Group : Silicate structure, Chemical composition, list of mineral varieties and their uses ii) Feldspar Group : Silicate structure, Chemical composition, list of mineral varieties and their uses iii) Silica Group : Silicate structure, Chemical composition, list of mineral varieties and their uses	

CRYSTALLOGRAPHY

<u>Unit-V</u>	<u>Introduction</u>	(11)
	i) Definition of the crystal ii) Unit Cell - definition, symmetry and space lattice iii) External morphology of the crystal - faces, edges, solid angle, forms, interfacial angle-its measurement and law iv) Elements of symmetry - plane, axis, and center. Crystallographic and geometric symmetry v) Crystallographic axis - lettering and ordering vi) Parameters and axial ratios - Parameter system of Weiss vii) Indices - Miller's system of indices, Law of rational indices	

- Unit-VI Descriptive Crystallography** (5)
- i) Classification of Crystals
 - ii) Description of the following systems:
 - a) Cubic system – Galena type
 - b) Tetragonal system Zircon type
 - c) Orthorhombic system – Baryte type

OPTICAL MINERALOGY

- Unit-VII** Introduction – nature of light, ordinary light, plane polarized light (1)
- Unit-VIII** Introduction to Petrologic Microscope – Schematic sketch, parts and uses. (2)
- Unit-IX** Study of the optical properties of the minerals – IPL – form, color, pleochroism, cleavage, relief, twinkling. BCN: Iso/anisotropism, extinction and DR colors. (4)

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PETROLOGY

- Unit-X**
1. Introduction – Science of petrology, definitions of petrology, petrography, petrogenesis and lithology, scope of petrology. (5)
 2. Definition of the primary, secondary and metamorphic rocks.
 3. Rock cycle.
 4. Characteristics of Igneous, Sedimentary and Metamorphic rocks
 5. Essential rock forming minerals

Unit-XI IGNEOUS PETROLOGY (15)

- i) Introduction to origin of Magma
- i) Elemental composition of the igneous rocks
- ii) Pyrogenetic minerals
- iii) Forms of Igneous rocks:
 - a) Extrusive forms : Fissure type and central type.
 - b) Intrusive forms :
 1. Concordant forms : Sill, Lopolith, Lacolith, and Phacolith
 2. Discordant forms : Dyke, ring dyke, cone sheet, volcanic neck, batholith, stock and boss, chonolith
- iv) Structures and textures of igneous rocks :
 - a) Structures : Definition and types – vesicular, amygdaloidal, ropy, pillow and columnar
 - b) Texture: Definition and types – equigranular, inequigranular (porphyritic) and glassy.
- v) Tabular classification and characters of the following igneous rocks: Granite, Gabbros, Pegmatite, Dolerite, Basalt and Obsidian

Unit-XII SEDIMENTARY PETROLOGY (15)

1. Introduction and definition of weathering, denudation, erosion, transportation, deposition, diagenesis, regolith soil.
2. Weathering – disintegration, decomposition, biological weathering.
3. Modes of transportation – traction, saltation, suspension
4. Causes and processes of deposition – Marine and terrestrial deposits.

5. Structures and textures :
 1. Structures – definition, types of structures physical, chemical and biological. Formation of current bedding, graded bedding, ripple marks, mud cracks, stratification(bed, stratum, Lamina)
 2. Textures – definition and types. Clastic, non clastic, bioclastic.
6. Classification
 1. Basis of classification of sediments (Wentworth)
 2. Basis of classification of products of weathering
 3. Description of the following rock types :
Conglomerate, Breccia, Sandstone, Shale, Limestone, Shell Limestone.

Unit-XIII METAMORPHIC PETROLOGY

(13)

1. Definition and general characters
2. Agents of metamorphism – temperature, pressure, chemically active fluids (water and gases)
3. Kinds of metamorphism
 - a) Local – Cataclastic, Contact, Hydrothermal, Pyrometamorphism
 - b) Regional – Burial, Dynamothermal, Ocean-floor
4. Depth zones and metamorphism
5. Grade of metamorphism
6. Definition of the terms Metamorphic facies and isograds
7. Structures of metamorphic rocks – granulose, schistose, gneissose
8. Description of the following rock types :
Marble, Slate, Hornblende schist, Hornblende gneiss, Mica-garnet schist, Biotite gneiss.

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 Total = 96

PAPER-II
HISTORICAL GEOLOGY

Unit-I Scope and subdivisions of Geology

(1)

Unit-II Earth in space

(11)

- i) The Solar system
 - a) Origin of the universe and the solar system
 - b) Salient characters of the nine planets and asteroid belt:
size, distance, density, no. of moons, composition, mass, rotational and revolution parameters in tabular form
- ii) The Planet Earth
 - a) Origin of the earth – Nebular, Tidal, and Big Bang Theory
 - b) Age of the earth – Uranium and Carbon 14 dating method.
 - c) Internal structure of the earth – Based on the temperature, density, and Earthquake waves etc.
 - d) Introduction to earth's magnetic field
 - e) Introduction to Structure of Atmosphere, Biosphere, Hydrosphere –
Ocean as thermostat for earth's surface heat balance – and lithosphere
 - f) Origin of Oceans and Continents and a very brief account of the
Origin of Indian subcontinent

Unit-III Physical Divisions of India

(2)

- i) Physical subdivisions of Indian subcontinent including the
Rivers and Mountains in each division and their salient features.
- ii) Tectonic map of India showing different tectonic features only.

Unit-IV Geotectonics

- i) Plate Tectonics (11)
- Definition and concept
 - Characters of the plates, list of the plates
 - Plate boundaries – Convergent and Divergent
 - Motion of the major plates and present status
 - Relation of the plate movements and earthquake activities
 - Theories of the Plate tectonics
 - Convection current
 - Thermal boundary layer concept
 - Hot plumes, hot spots and triple junctions
 - Sea-floor spreading
 - Introduction to the Indian Plate movement.
- ii) Continental Drift (6)
- Definition and concept
 - Theories of drifting
 - Taylor's hypothesis
 - Wagner's hypothesis - evidences such as geometry, paleontology, stratigraphy, glacial, structure, polar wandering
 - Future of the earth – drifting in relation to the plate motion
- iii) Mountains – Diastrophism (3)
- Definition
 - Types of mountains
 - Classification
 - Modern concept of origin
 - Indian mountains
- iv) Isostasy (3)
- Definition
 - Hypothesis – Pratt's, Airy's, Heiskanen's
 - Effects and adjustments of isostasy
- v) Earthquakes (4)
- Definition and causes
 - Earthquake regions of the world
 - Elements of earthquakes
 - Classification of earthquakes
 - Scale - intensity and magnitude of earthquakes
 - Indian examples of major earthquakes
- vi) Volcano (4)
- Definition
 - Structure of a volcano
 - Types of volcano based on
 - State of volcano
 - Mode of eruption
 - Products of volcano – Magma, lava, gases, pumice, lapilli, scoria, volcanic bomb, volcanic breccias, volcanic dust and ash
 - Distribution of volcanoes in the World and in India
- vii) Glaciation (1)
- Definition and concept
 - Types and Causes, and Period of glaciations
 - Glaciations in India

PAPER-II
PALAEOTOLOGY

<u>Unit-V</u>	Definition and branches of Paleobiology	(2)
<u>Unit-VI</u>	<u>Fossil Study</u>	(9)
	a) Definition	
	b) Conditions of fossilization	
	c) Modes of preservation - unaltered and altered remains	
	d) Techniques of collection, separation, preservation, illustration and recording - description - of animal and plant fossils.	
	e) Uses of fossils	
<u>Unit-VII</u>	<u>Geological Time Scale</u>	(2)
	i) Definition, concept of time	
	ii) Basis for the time classification	
	iii) Divisions of time - Eon, Era, Period, Epoch	
	iv) Tabular classification of Geologic Time Scale.	
<u>Unit-VIII</u>	<u>Invertebrate Fossil study</u>	(1)
	i) Brief Introduction to the origin of life	
	ii) Systematic position, geological and geographical distribution, environmental factors and study of hard part (internal and external) morphology of :	
	a) Phylum Mollusca	
	i) Bivalvia - special reference to the hinge line and type isodont, taxodont, heterodont, schizodont, cyclodont, dysodont	(5)
	ii) Gastropoda - special reference to the forms - discoidal, conical, turritid, fusiform, globular, turbinate, biconical, convolute	(6)
	iii) Cephalopoda - special reference to suture lines in Ammonites - agoniatitic, goniatitic, Ceratitic, ammonitic. Difference between Nautiloids Ammonoids	(4)
	b) Phylum Brachiopoda - special reference to the brachial skeleton - ribbed and spiral type. Difference between brachiopods and bivalves.	(4)
	c) Phylum Echinodermata - special reference to the apical disc	(5)
	d) Phylum Arthropoda - Trilobite - head, thorax and pygidium	(4)
<u>Unit-IX</u>	<u>Stratigraphy</u>	(6)
	a) Definition and scope	
	b) Principles of stratigraphy	
	c) Building of the stratigraphic column - lithostratigraphic, chronostratigraphic and biostratigraphic Units	

PAPER III
PRACTICALS

- Books :** 1. All the manuals related to practicals
2. All theory books for reference work.

- Practical 1.** Introduction to the practical and introduction to the physical characters of the Minerals. Show the different mineral showing different color, sp.gr., form, cleavage, hardness, fracture etc.
- Practical 2.** Study of the physical properties of the following minerals
i) Native copper ii) Halides - Halite, Fluorite iii) Sulphide - Galena Pyrite
iv) Oxides - Haematite, Bauxite, Corundum v) Carbonates - Calcite, Magnesite
vi) Sulphates - Barytes, Gypsum vii) Phosphates - Apatite viii) Silicates -
Olivine, Garnet, Beryl, Actinolite, Biotite, Muscovite, Talc, Kyanite,
Orthoclase, Quartz crystal, Rosy quartz, Amethyst, Jasper, Flint, Chalcedony,
Agate, Opal.
- Practical 3.** Determination of specific gravity of any 4 minerals using Walker's steelyard
Balance
- Practical 4.** Introduction to crystallography. Study of Cubic system - Galena type.
- Practical 5.** Study of Tetragonal system - zircon type
- Practical 6.** Study of Orthorhombic system - barite type
- Practical 7.** Use of goniometer and introduction to petrological microscope
- Practical 8.** Optical properties of minerals - no identification
- Practical 9.** Reading of toposheets - show the toposheets and the sign and symbols of
contour lines, hills, valleys, fort, cliff, village, RF, PF, roads, railways.
- Practical 10.** Study of 4 maps showing all the landforms and section along X-Y.
- Practical 11.** Petrology - Introduction to rock characters and study of megascopic rocks
Igneous - Granite, Gabbro, Pegmatite, Dolerite, Basalt, Obsidian
- Practical 12.** Sedimentary - Conglomerate, Breccia, Siliceous sandstone,
Shale, Mudstone, Limestone, Shell limestone
- Practical 13.** Metamorphic - Marble, Slate, Hornblende schist, Hornblende
Gneiss, Mica-garnet schist, Biotite gneiss
- Practical 14.** Paleontology - Study of at least 15 specimens with 2 from each phylum
- Practical 15.** Study of maps - horizontal maps 4 maps and 2 maps with vertical dyke
- Practical 16.** Field visit to at least 3 places along river, hill, village and its report
- Practical 17.** Submission of one term paper - per term - either on the geology of the
Village or any topic of geological interest.
