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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC.2(S)/486/16-17 **Dated:** 20**.06.2017**

NOTIFICATION

Sub: Modification in the existing Syllabus of B.Sc. in Earth Science from the Academic Year 2017-18.

Ref: 1. Decision of the Faculty of Science & Technology Meeting held on 03.03.2017.
2. Decision of the Academic Council meeting held on 30.03.2017.

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The Board of Studies in Earth Science (Graduate) which met on 17.12.2016 has recommended to modify the existing Syllabus of Earth Science in B.Sc. course from the academic year 2017-18.

The Faculty of Science and Technology and the Academic Council at their Meetings held on 03.03.2017 and 30.03.2017 respectively have also approved the above said proposal and the same is hereby notified.

The Modified B.Sc. in Earth Science course Syllabus is as follows:

	Existing paper title	New title proposed
IV Semester	Principles of Palaeontology and Stratigraphy, Fossil fuels, Engineering Geology	Palaeontology, Principles of Stratigraphy
V Semester	Ore Geology and Indian mineral deposits	Economic Geology and Engineering Geology
VI Semester	Gemology, Petrographic Techniques and Hydrogeology	Gemology, Optical mineralogy, Hydrogeology and Mining Geology
	Apart from the above, a few additions were made to the I semester syllabus. In the paper internal structure of the Earth-crust, mantle and core was added.	

The concerned may download the modified contents in the University Website i.e., www.uni-mysore.ac.in.

Draft approved by the Registrar

Sd/-
Deputy Registrar (Academic)

To:

1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Dean, Faculty of Science & Technology, DOS in Physics, MGM.
3. The Chairperson, BOS/DOS in Earth Science (UG), Manasagangotri, Mysore.
4. The Principals of the Affiliated Colleges running UG Program in Science stream only.
5. The Director, College Development Council, Moulya Bhavan, Manasagangotri, Mysore.
6. The Co-ordinator, Directorate of Online & Outreach program, Parakalamata, MGM.
7. The Deputy/Assistant Registrar/Superintendent, AB and EB, University of Mysore, Mysore.
8. The P.A. to the Vice-Chancellor/Registrar/Registrar (Evaluation), UOM, Mysore.
9. Office file.

UNIVERSITY OF MYSORE
MAHARANI'S SCIENCE COLLEGE FOR WOMEN, MYSORE-2017-18
B.SC., GEOLOGY COURSE STRUCTURE AND ALLOCATION OF MARKS (REVISED)

SEMESTER	PAPER	TITLE OF THE PAPER	THEORY			PRACTICAL		
			NO. OF TEACHING HOURS	MARKS		NO. OF PRACTICALS	MARKS	
				EXAM	IA		EXAM	IA
First	Paper I 20035*	Introduction to Earth system-I and Crystallography	42	60	10	--	--	--
	Practical I A542*	Crystallography	--	--	--	14	20	10
Second	Paper II 20135*	Introduction to Earth system-II and Mineralogy	42	60	10	--	--	--
	Practical II B542*	Mineralogy	--	--	--	14	20	10
Third	Paper III 20233*	Petrology	42	60	10	--	--	--
	Practical III C542*	Petrology	--	--	--	14	20	10
Fourth	Paper IV 20332*	Paleontology and principles of stratigraphy	42	60	10	--	--	--
	Practical IV D542*	Paleontology	--	--	--	14	20	10
Fifth	Paper V 20446*	Indian stratigraphy and structural geology	42	80	20	--	--	--
	Practical V E544*	Structural geology	--	--	--	14	40	10
	Paper VI 20447*	Economic geology and engineering geology	42	80	20	--	--	--
	Practical VI E546*	Tracing of outcrops, dip and strike problems	--	--	--	14	40	10
Sixth	Paper VII 20648*	Remote sensing and geoexploration	42	80	20	--	--	--
	Practical VII F90*	Petrographic techniques-I	--	--	--	14	40	10
	Paper VIII 20649*	Gemology, optical mineralogy, hydrogeology and mining geology	42	80	20	--	--	--
	Practical VIII F91*	Petrographic techniques-II and ore geology and field report	--	--	--	14	40	10 Field Report

Note: * (star) denotes code nos.

SUBJECT- GEOLOGY

SYLLABUS

B.Sc., Geology Syllabus for Semester System

FIRST SEMESTER

Paper -1 Introduction to Earth System-I and Crystallography

		Th	IA
Dynamics of the earth-I	Theory 3h/week	60	10

UNIT-1

Definition of geology, relationship with other branches of science, importance, scope and different branches of geology.

Components of earth system: atmosphere, lithosphere, hydrosphere, biosphere.

Origin of the earth; based on various hypotheses

Internal structure of the Earth-Crust, mantle and core 7 hr

UNIT-2

Age of the earth: radiometric methods (Rb-Sr, U-Pb, Sm-Nd, Pb-Pb) of age determination.

Geological agents: definition, classification- a) epigene and b) hypogene

EPIGENE AGENTS:

Weathering: types, mechanical, chemical and biological weathering

Wind: geological action of wind, deflation, abrasion, attrition, erosional features- pedestal rock, transportation-suspension, saltation, traction, deposition-sand dunes, barchans, and loess.

7 hr

UNIT-3

Rivers: stages of rivers-young, mature and old, geological action of rivers: erosion- hydraulic action, abrasion, attrition.

Erosional features-m pot holes, V-shaped valleys, waterfall, canyons, base level erosion, meanders, oxbow lake, transportation-suspension, solution, saltation, deposition-alluvial fans and deltas, Groundwater: geological action of ground water- Erosional features-sinks, caverns, solution valleys-transportation-solutional, depositional features-concretions, stalactites and stalagmites.

Oceans: topography of ocean floor, continental slope, shelf abyssal zone, mid ocean ridges, waves, tides, currents and circulation of waters.

7 hr

UNIT-4

Geological work of oceans-erosion, transportation, deposition.

Coral reef: types of reefs- fringing, barrier, atoll.

Glaciers: movement of glaciers, types of glaciers-valleys, piedmonts, icecaps, geological action of glaciers, erosion-abrasion, excavation, frost wedging. Erosional features- cirques, U-shaped valleys, hanging valleys. Transportation-glacial drift, deposition-moraines and Tillites.

7 hr

UNIT-5

CRYSTALLOGRAPHY

Introduction: definition and scope of crystallography, definition of a crystal, formation of crystals: crystalline and amorphous substances, crystal elements: interfacial angle, contact goniometer.

Crystallographic axes; axial characters of geometrical constants; axial ratio; classification of crystals in to systems based on geometrical constants.

7 hr

UNIT-6

Symmetry in crystals: definition, elements of symmetry-centre, plane, axis and roto-inversion axis of symmetry, symmetry notation- Hermann Mauguin symbols: parameters: crystallographic notation-millers, laws of rational indices, grade of symmetry.

Twins: definition, parts of a twin, types of twins.

7 hr

Total 42 hrs

Books:

1. Principles of geology-Arthur Holmes
2. Physical geology-Longwell and flint
3. General geology-Radhakrishna y
4. The dynamic earth-Wyllie P.J
5. The way earth works- Wyllie P.J
6. Physical geology-Spring Field
7. Geomorphology-Thornbury
8. Geomorphology-Cavies
9. Physical geography today-Muller and Oberlander
10. An introduction to crystallography-Buerger
11. Elementary crystallography- Buerger
12. Crystallography and crystal chemistry-Bloss D
13. Crystal chemistry-Kutty T.R.N and Tareen J.A.K
14. Elements of X-rays crystallography-Axaroff
15. An introduction to crystal chemistry- Evan.R.C.
16. Elemental crystallograophy-Tareen.J.A.K. And Kutty T.R.N.
17. Crystal chemistry and its significance in the growth of technical materials-Byrappa. K and Pushehorovsky.D.Yu.

PRACTICAL (PR-1) CRYSTALLOGRAPHY

	Th	IA
Prac. 3hrs/week	20	10

The study of mathematical relationships of crystal elements (Euler's formula) F+A=E+2, classification of crystals into six systems on the axial characters.

Measurement of interfacial angle using contact goniometer. The study of symmetry elements (grade of symmetry) in crystals. Simple holohedral forms of the six systems and Twins.

Total 14 Practicals

SECOND SEMESTER

Paper- 2. INTRODUCTION TO EARTH SYSTEM-II AND MINERALOGY

	Th	IA
Theory 3h/week	60	10

UNIT-1

Dynamics of The earth-II

HYPOGENE AGENTS:

Volcanoes: definition, description of typical volcano, classification of volcanoes-active, dormant, extinct, central, fissure, product of volcanoes, hot springs, geysers, fumaroles, causes of volcanoes.

Earthquake: definition, focus, epicenter, causes and effects of earthquakes, seismic waves- P, S, and L waves, seismograph, recent earthquakes in India.

7 hrs

UNIT-2

Plate tectonic theory: Plates and their margins, constructive margin, destructive margin, continental plate boundaries, ocean plate boundaries, causes of movement of the plates, paleo magnetism, seafloor spreading and hotspots.

7 hrs

UNIT-3

MINERALOGY

Introduction: definition of mineral, history of mineralogy, branches of mineralogy.

Physical mineralogy: characters depending upon the state of aggregation –habit, form. Characters depending upon cohesion and elasticity: cleavage, fracture, hardness, tenacity.

7 hrs

UNIT-4

Characters depending upon light: color, streak, luster, diaphaneity, iridescence, opalescence, luminescence, fluorescence, phosphorescence, tarnish. Characters depending upon electricity and magnetism: conductivity, pyro, piezo, Para and diamagnetism.

Specific gravity and methods of determining specific gravity: Isomorphism and Polymorphism.

7 hrs

UNIT-5

Descriptive Mineralogy: classification of minerals based on chemical composition. Oxides and carbonates, silicates, abundance in the crust, classification of silicates, based on structures: neo, soro, cyclo, iono, phyllo and tecto silicates.

7 hrs

UNIT-6

Study of group of minerals: garnet group, pyroxene group, amphibole group, mica group, quartz and feldspar groups.

7 hrs

Total 42 hrs

Books:

1. Principles of Geology-Arthur Holmes
2. Physical geology-Longwell And Flint
3. General geology-Radhakrishna Y
4. The dynamic earth-Wyllie P.J.
5. Mineralogy, Crystallography & Crystal Chemistry – Bloss.D
6. Textbook of Mineralogy – Dana
7. Rock Forming Minerals – Deer, Howie & Zussman
8. Mineralogy – Shrock
9. Manual of Mineralogy – Klien, C & Hurlburt, C.S.Jr.
10. Optical mineralogy- Naidu.P.R.J.
11. Optical mineralogy- Kerr. P.J.
12. Optical crystallography-Wahlstrom.E.E.

PRACTICALS (PR II): MINERALOGY		Th	IA
	Prac 3hrs/week	20	10

Identification of the following minerals based on their physical characters.

1. Oxides: corundum , Halides: Fluorite, Halite.
2. Carbonates: Calcite, Magnesite, Siderite, Rhodochrosite, Dolomite.
3. Phosphates: Monazite, Apatite.
4. Sulphates: Barytes, Gypsum.
5. Silicates:
   Nesosilicates: Olivine, Garnet, Zircon, Andalusite, Sillimanite, Kyanite, Topaz, Staurolite
   Sorosilicates: Epidote
   Cyclosilicates: Beryl, Tourmaline.
   Inosilicates:
   Pyroxenes: Enstatite, Hypersthene, Diopside, Augite.
   Amphibole: Hornblende, Tremolite, Actinolite.
   Phyllosilicate: Serpentine, Talc, Muscovite, Vermiculite, Biotite, Epidote, Chlorite.
   Tectosilicates: Quartz and its varieties.
   Feldspars- Microcline, Orthoclase, Plagioclase- Labradorite.
   Feldspathoids- Leucite, Nephelene, Sodalite

Total 14 Practicals

THIRD SEMESTER

Paper-3. PETROLOGY		Th	IA
	Theory 3h/week	60	10

UNIT-1

Introduction. Definition of a rock, relationship of petrology with other branches of Geology, composition of the earth's crust classification of rocks, igneous, sedimentary and metamorphic rock, rock cycle.

IGNEOUS ROCKS: Forms of igneous rocks, Extrusives and Intrusives: Concordant - Sill, Laccolith and Phacolith. Discordant - Dyke, Ring Dyke, Cone Sheets, Volcanic Neck, Stock, Boss and Batholiths. Structures: Vesicular; Amygdaloidal, Blocky, Ropy, Pillow, Columnar.

7 hrs

UNIT-2

Textures - Crystallinity, granularity and mutual relationship of crystals. Kinds of textures: Equigranular, Panidiomorphic, hypidiomorphic and allotriomorphic,
Inequigranular - Porphyritic, poikilitic, ophitic, basaltic, intergrowth and flow texture.

7 hrs

UNIT-3

Classification: Bases of classification- chemical, mineralogical and textural. Tabular classification of Tyrrell. Petrogenesis- Introduction-concept of system, phase and component, chemical potential and phase rule. Unicomponent system (SiO_2) and Binary systems (Fo-Fai, Ab-An) magma, lava, types of magma, temperature of magma, composition of magma, crystallization of binary magma. Bowen's reaction principle, differentiation and assimilation.

7 hrs

UNIT-4

Sedimentary rocks: Sedimentation - Weathering, transportation, lithification and diagenesis. Structures of Sedimentary rocks; ripple marks, sun cracks, rain prints, stratification, current bedding

and graded bedding. Size and shape of the grains, and cementing material. Classification based on mode of formation- residual, mechanical, chemical and organic. Based on grain size -rudaceous, arenaceous, argillaceous.

Depositional environment - terrestrial, laccustrine, fluvial, marine.

7 hrs

UNIT-5

Metamorphic rocks: Agents of metamorphism, kinds of metamorphism–Contact (thermal), Regional (dynamothermal) and its grades, dynamic (cataclastic), plutonic, pneumatolytic.

7 hrs

UNIT-6

Structures -gneissose, schistose, granulose. Effects of thermal metamorphism on argillaceous sediments and calcareous sediments. Effects of regional metamorphism on argillaceous sediments and basic igneous rocks.

7 hrs

Total 42 hrs

Books:

1. Principles of petrology: Tyrrell - Chapmann and Hall publications.
2. Igneous and Metamorphic petrology: Turner and Verhoogen - 1962, Allied Publishers, Bombay. Metamorphic petrology by Winkler HGF 1987 - Nirosa publications
3. Sedimentary rocks by Pettijohn 1984 - CDS Pub\. NEW DELHI
4. Sedimentary rocks by Greensmith 1984
5. Manual of sedimentary petrology - Krymbein & Pettijohn
6. Petrology of Sedimentary rocks - Folk. R.L.
7. Origin of Sedimentary Rocks - Blalt. H, Middleton, G.V. & Murray. R.C.

PRACTICAL (PR III) PETROLOGY	Th	IA
Prac. 3 hrs/week	20	10

Identification of rocks: Megascopy

Igneous rocks: granite, syenite, diorite, gabbro, peridotite, Dunite, porphyries, granite, syenite, diorite, felsites, pegmatite, dolerite, obsidian, pitchstone, rhyolite, trachyte, basalt, andesite.

Sedimentary rocks: conglomerate, breccia, sandstone, shale, grit, limestone, shell limestone, oolitic limestone.

Metamorphic rocks: quartzite, schist, gneiss, marble, slate, phyllites, charnockite, granulites and basic granulites.

Total 14 Practicals

FOURTH SEMESTER

Paper-4. PALEONTOLOGY AND PRINCIPLES OF STRATIGRAPHY	Th	IA
Theory 3h/week	60	10

UNIT-1

PALEONTOLOGY

Introduction: Definition, relationship with other branches of geology, classification of life plant and animals- invertebrates and vertebrates-phylum, class, order, genera, species, fossils, fossilization, different modes of fossilization; mummification, carbonization, petrification, casts and moulds, tracks and trails. Types of fossils- index, extinct, synthetic and persistent fossils with examples. Micropaleontology, utility of fossils. Uses of fossils in stratigraphic classification, paleogeography, evolution of life and in the exploration of fossil fuels. Life through ages.

7hrs

UNIT-2

PALAEONTOLOGY-2

Phylum **Protozoa**: Order: **Foraminifera**-General morphology, test wall- calcareous, chitinous, and agglutinated- septa, arrangement of chambers, suture, aperture, dimorphism, classification, geological history and stratigraphic importance. An outline on the applications of foraminifera in oil exploration.

Phylum **Cnidaria**:

Class **Anthozoa**: General morphology, corallum, corallite, theca, chambers, septa, tabulae, dissepiments, sinapticulae, fossula, columella, septal developments, classification- rugose corals, tabulate corals and modern corals, geological range and stratigraphic importance.

Phylum **Echinodermata;** class: **Echinoidea-** Morphology of the shell, regular and irregular echinoids: Apical system- ambulacral and interambulacral areas, peristome.

A brief outline on the classification of vertebrates - A very short account of the evolution of man, elephant and horse. Gondwana flora of India. An outline of the uses of Micropaleontology.

Phylum: **Hemicordita**, Subphylum; **Graptolithina**: Order: **Graptoloidea**: General morphology, rhabdosome stipe, theca, common canal, nema, virgula, sicula, uniserial, biserial, classification, geological distribution and stratigraphic importance.

7 hrs

UNIT -3

Phylum Mollusca**:**

Class – **Pelecypoda(Lamellibranchia)**: General characters-soft parts, shell, umbo hinge line, ligament, lunule and escutcheon- adductor impressions, pallial line, pallial sinus,dentition, ornamentation, classification, geological history.

Class – **Gastropoda**: General characters- soft parts, shell, shell forms, whorl, spire, suture aperture- (holostomatus, siphanostomatus) columella, umbilicus, peristome, types of coiling- dextral & sinistral, orientation, ornamentation, classification and geological history.

Class- **Cephalopoda**: General morphology. **Nautiloidea** - morphology, shell, brief description **Ammonoidea -** Morphology, siphuncle,septa, septal necks. prosiphonate, retrosiphonate, chambers, protoconch, phragmacone, body chamber, suture lines- saddles, lobes, suture type- nautilitic, goniatitic and ammonitic- shell forms, ornamentation classification- evolution (size, coiling, suture), geological history.

7 hrs

UNIT -4

Phylum **Arthropoda**:

class: **Trilobita**: General morphology. Cephalon-glabella, facial suture, free cheek, fixed cheek, genal angle, genal spine, cranadium, Thorax- segments, pleurae, pleural spine. Pygidium. Classfication, geological history- stratigraphic importance.

Phylum **Brachiopoda**: General characters- soft parts, shell, beak, umbo, pedicle opening, delthyrium, deltidial plates, hingeline, articulata & inarticulate, teeth & sockets, brachial skeleton, ornamentation- classification, geological range in time.

7 hrs

UNIT-5

PRINCIPLES OF STRATIGRAPHY:

Introduction; principles of stratigraphy; law or catastrophism, law of unifromatarian, law of order of superposition, nature of geological record, imperfections in geological record.

7hrs

UNIT-6

Correlation: Types of correlation, criteria for stratigraphic correlation; lithological, stratigraphical, structural, metamorphic, paleontological (biological), geochronogical.

Standard stratigraphical record and its equivalents in India. Classification of geological record into Archaean, Proterozoic, 9aleozoic, Mesozoic and Cenozoic.

7 hrs

Total 42 hrs

Books:

1. Principles of paleontology-Wood,H
2. Principles of paleontology- Sweinnerton.H.M
3. Introduction to paleontology- Jain.P.C.amd Anantharaman.M.S.
4. Paleobotany-Andrews
5. Principles of invertebrate paleontology- Shrock. RR. And Twenhofel.H
6. A text book of geology- P.K.Mukherjee
7. Vertebrates-Colbert C
8. Vertebrate paleontology- Romer A.

PRACTICAL (PR IV) PALEONTOLOGY Th IA

Prac. 3 hrs/week 20 10

Megascopic identification and description of the following fossils:

Corals: Calceola, zapherentis , lithostrotion, favosites, halysites.

Brachiopoda: Spirifer, producters, terebratula, rhynconella, atrypa.

Pelecypoda: Cardita, pectin, trigonia, gryphea, hippurites.

Echinodermata: cidaris, micraster

Gastropoda: Natica, turritella, cerithium. conus, voluta, physa.

Cephalopoda: Nautilus, goniatites, ceratites, acanthoceras, hamites.

Trilobita: Paradoxide, calamene, phacops, trinucleus.

Identification of Micro fossils: Foraminifera: lagena, nodosaria, textularia,

Techniques of separation of microfossils from the sediments.

Plant fossils: Calamites, Lepidodendron, Sigillaria, Glossopteris, Ptillophyllum, and Cordiates.

Total 14 Practicals

FIFTH SEMESTER

Paper 5.1 INDIAN STRATIGRAPHY AND STRUCTURAL GEOLOGY Th IA

Theory 3h/week 80 20

INDIAN STRATIGRAPHY

UNIT-1

Physiographic divisions of India- Peninsular, Extra-peninsular and Indo-gangetic alluvial plains. Archaeans of Peninsular India, Distribution- Karnataka. Sargur group and Dharwar super group. Proterozoic (Purana group) basins of Karnataka- Cuddapah, Kaladgi, Badami, Bhima, Karnool group. Cambrian rocks of Spiti- Distribution, lithology, classification and a brief account of fossil record.

7 hrs

UNIT 2:

Gondwana stratigraphy- Nomenclature, lithology, distribution, classification, age, economic deposits and a brief account of plant fossil record.

Cretaceous rocks of Tiruchirapalli- Distribution, lithology , classification, life and age limit.

7 hrs

UNIT-3

Deccan traps- Distribution, lithology, infra trappeans- bagh and lamata beds.
Intertrappeans- Gurumatkal intertrappeans . Supratrappeans-Nummulitic limestone. Age of Deccan traps- based on fossils evidence and geochronology. Economic importance.
Siwalik group- Distribution, lithology ,classification, life and age of Siwaliks. Recent alluvium.

7hrs

UNIT-4

STRUCTURAL GEOLOGY

Introduction: structural geology and its importance.Concept of deformation. Forces - tensional, torsional. shearing and compressional. I). Primary structural forms – Igneous Rocks and Sedimentary. Conformity and unconformity-definition-origin-types-disconfirmity, nonconformity and angular unconformity: recognition and significance. Attitude of beds: definition of dip (true and apparent dip) and strike. Description of compass clinometers and determination of dip and strike of beds.
Outcrop-definition, width of an outcrop and thickness of bed. Factors controlling the width of the bed.

7 hrs

UNIT-5

SECONDARY STRUCTURES:
Folds: Definitions - parts of folds, axis, axial planes, limb, plunge. Crest and troughs. Typesof folds-symmetrical and asymmetrical-anticline, syncline, anticlinorium, synclinorium,overturned fold, recumbent fold. isoclinal, chevron, fan folds, monocline and drag folds.Denudational structures - Outlier and inlier. 7 hrs

UNIT 6:

Faults: Definition - Elements of fault, Fault planes, Dip, Strike, Hade, Heave and Throw. Hanging and footwalls. Classification - I. Geometrical: I) Based on attitude of faults as compared to the adjacent beds. Dip, Strike, Diagonal and Bedding faults ii) Based on Apparent movement; normal and reverse faults. II. Genetic: Thrust faults, over thrust, and under thrust. Gravity faults - Step fault, Ridge fault, trough faults. Criteria for recognition of faults in the field.

Joints: Definition, Dip, Strike. Joint plane, block Joint, Joint set, Joint system. Classification – I. Geometrical: Dip, Strike, Oblique and bedding joints II. Genetic – columnar, mural sheet joints, Master joints. Importance of joints.

7 hrs

Total 42 hrs

Books:

1. Field Geology - Lahee, W.
2. Structural Geology - Billings, M.P.
3. Symbols for maps and rocks - Amer. Geol. Inst. Publ.
4. Topographic sheets - Survey of India Publ.
5. Geological Map of India and Karnataka
6. Indian Striatigraphy - Wadia, D.N.
7. Geology of India and Burma - Krishnan, M.S.
8. Geology of Karnataka - Mem.GeoI.Soc.India
9. Deccan Basalts - Mem.Geol.Soc.India
10. Geo- Karnataka - Mys.Geol.Dept.Cent. Vol.
11. Principles of historical geology- Ravindrakumar.

Paper 5.2 ECONOMIC GEOLOGY AND ENGINEERING GEOLOGY

	Th	IA
Theory 3hr/week	80	20

UNIT-1:

ORE GEOLOGY: Introduction to ore geology in relation of industry, commerce and national economy. Essential, strategic and critical minerals. Ore minerals, Gangue minerals, Tenor of ore.

Principles and Processes of Ore formation: Magmatic processes: Early and late magmatic deposits. Contact metasomatism: Skarn deposits.

Hydrothermal processes: Hydrothermal fluids and their migration and deposition. Cavity filling and Replacement deposits.

7 hrs

UNIT-2

Weathering processes: Residual, mechanical concentrations (placers) - Eluvial, Stream and Marine Deposits. Sedimentation: Fe and Mn cycles.

Oxidation and supergene enrichment: Gossans.

Metamorphism: Metamorphic deposits

Classification of ore deposits - Jenson and Bateman. Metallogenic Epochs and Provinces.

7 hrs

UNIT-3:

Indian mineral deposits

Study of the following deposits of India with special reference to Karnataka with regards to their mineralogy, origin, occurrence and distribution.

Metallic deposits: gold, copper, iron, manganese, aluminium, chromium

Non-metallic deposits: mica, abrasives, refractories, building and ornamental stones

7 hrs

UNIT-4:

Fossil fuels

Petroleum and coal: petroleum-origin, migration and accumulation of oil. Oil taps, on-shore and off-shore oilfields of India. Coal-stages and periods of coal formation, lower gondwana coal fields, peat and lignite deposits.

7 hrs

UNIT-5

ENGINEERING GEOLOGY

Stability of rock slopes and cutting in rocks: Classification of slopes- stable and unstable slopes- Geological parameters. Measures for stabilization of slopes. Cuttings in rock slopes- cut design and geological parameters.

Dams and reservoirs: Types of Dams: 1. masonary or concrete dams- gravity, arch and butress. 2. Earth Dams and 3.composite dams. Location of dam. Geological considerations- topography, structure and lithology. Foundation and seepage problems in dams and their treatment. Reservoir: Reservoir problems- seepage and silting.

7 hrs

UNIT-6

Tunnels: terminology, definition, types- hard rock and soft rock tunnels.

Bridge sites: Terminology, Bridge structure, types, bridge problems, and stability of bridges. Geology of bridge sites.

7 hrs

Total 42 hours

Books:

1. Economic Mineral Deposits - Jenson and Bateman, A.M
2. Mineral Deposits by Lindgren
3. Ore Deposits by Park and Mc Diarmid
4. Ore-deposits of India - Gokhale and Rao
5. Indian Mineral Resources - Krishnaswamy, S and Sinha.
6. Metallic and Industrial minerals - Lamey, G.A.
7. Introduction to India's economic minerals - Sharma, N.L. and Ram. K.S.
8. A treatise on Industrial Minerals of India - Sinha. R.L.
9. Structural Geology - Billings, M.P.
10. Symbols for maps and rocks - Amer. Geol. Inst. Publ.

PRACTICAL (PR V): STRUCTURAL GEOLOGY

	Th	IA
Prac. 3h/week	40	10

Study and Interpretation of Topographical Maps: Description of the relief features and drawing of profile of contour maps. Geological Maps – Drawing of section and interpretation. Horizontal series and inclined series without intrusive and with intrusive rocks.
Faults: vertical and inclined with intrusive rocks. Folded series, unconformity series. Complex map consisting of folds, faults, unconformities and intrusions.
A total of 20 maps covering the above topic.

Total 14 **Practicals**

PRACTICAL (PR VI): TRACING OF OUTCROPS, DIP AND STRIKE PROBLEMS.

	Th	IA
Prac. 3h/week	40	10

Tracing of outcrops, dip and strike problems.

1. Determination of the amount of apparent dip in the given direction, from given amount and direction of true dip.
2. Determination of true dip, when the amount and direction of apparent dips are known.
3. Determination of the apparent dips, when the true dip amount and directions are known.
4. Determination of the direction of the apparent dip, when the true dip and amount of apparent dips are known.

Calculations of the thickness of the strata, horizontal surface, slope in the direction of dip and slope against the direction of dip.

Total 14 **Practicals**

SIXTH SEMESTER

Paper 6.1 REMOTE SENSING AND GEOEXPLORATION

	Th	IA
Theory 3hr/week	80	20

UNIT-1

Remote sensing using aerial photograph. Types of aerial photography-conrolling factors of aerial photography. Scale of photography. Flight plan-area, purpose-time and season. Overlap, sidelap, drift

and crab. Types of mosaics and camera parameters. Phogrammetry and instrumentation in aerial photography.

7 hrs

UNIT-2

Satellite Remote Sensing: Principles of Remote sensing, stages in remote sensing.

Electromagnetic radiation- characteristics of electromagnetic spectrum; interaction of EMR with the earth's surface (reflection, surface roughness, transmission, spectral signature) and with the atmosphere (scattering, absorption, atmospheric windows, refraction, atmospheric haze).

Platform, sensors, resolution, multispectral scanners- across- track and along- track multispectral Scanning, data reception and product generation.

Microwave remote sensing: SLAR & SAR,LISS, NIR, TIR and different Indian satellites in brief, NRSA centers, RRSSC centers, IIRS centers and activities with respect to Indian satellite data products.

7 hrs

UNIT-3

GEOEXPLORATION:

Introduction on Prospecting and Exploration. Classification of Prospecting methods Principless of Exploration: Geological, Geophysical and Geochemical Methods.

GEOLOGICAL EXPLORATION

Guides and criteria for locating ore deposits. Stratigraphic, lithological, structural, geomorphological, palaeogeographic and palaeoclimatic Criteria. Preliminary and detailed exploration, exploratory works – drilling and core logging, exploratory grids, sampling methods, economic evaluation of mineral deposits.

7 hrs

UNIT-4

GEOPHYSICAL EXPLORATION

Introduction: Methods of Exploration.

Gravity Method: Introduction, basic principle, gravity of the earth, gravity reductions, densities of rocks and minerals, density estimates from field results, Gravimeters-Stable type, field operations, results and interpretation.

Magnetic Method: Introduction, Basic principle, Magnetism of the Earth, Magnetism and magnetic susceptibilities of rocks and minerals, Field instruments, field operations. Results and interpretation.

Electrical Methods: Introduction, electrical properties of rocks and minerals.

Resistivity method: Elemental theory, resistivity meters, electrode layouts – Wenner and Schlumberger spreads, Field procedure, Application of resistivity method in ground water search.

Seismic Methods: Introduction, principles of reflection and refraction methods, field equipments – Geophones, results and interpretation.

7 hrs

UNIT-5

GEOCHEMICAL AND BIO-GEOCHEMICAL EXPLORATION

Introduction, Geochemical Cycle – Deep seated & surficial, geochemical mobility of elements. Pathfinder elements. Thershold values and geochemical anomaly. Dispersion – Primary & secondary. Lithogeochemistry, soil metallometry, stream sediments, Hydrochemical, Atmochemical and Biogeochemical methods, Geobotany.

7 hrs

UNIT-6

FIELD GEOLOGY

Introduction, field equipments, a brief note on taking geologic notes in the field, collection of samples, numbering and marking specimens. Determination of dip and strike using compass clinometer and Brunton compass. Types of maps- topographic, geologic and aerial photographs.

Study of toposheets. General survey procedures, selecting and preparation of a base map, detailed mapping and sampling and their types. Preparing of geological reports.

7 hrs

Total 42 hrs

Books:

1. Introduction to photogrammetry by Wolf
2. Aerial photographic interpretation. Principles and applications – D.R.Leuder.
3. Photogeology – Miller.J.C
4. Photogeology by S.L.Pandey
5. Principles of remote sensing –A.S.Patel and Surendra Singh
6. Geochemistry in mineral exploration Hawkes. H & Wobb J.S. Harper & Row New York.
7. Principles of Geochemical prospecting. Ginzburg. I.I. Petgaon Press, N.Y. London.
8. Biochemical methods of Prospecting - Malyuga, D.P.
9. Principles of Mining Geology-Arogya Swamy.
10. Introduction to geophysical prospecting - Milton B, Dobrin Mc Graw Hill Book

Paper 6.2 GEMOLOGY, OPTICAL MINERALOGY, HYDROGEOLOGY AND MINING GEOLOGY

UNIT-1

GEMOLOGY

Introduction- a brief history of gemstones. Carot, colour, clarity, inclusion, gem defects, water and fire. A detailed study of important gem materials, their characters and occurrences- Indian occurrences in particular:

Precious varieties: a) diamond b) Ruby c) Sapphire d) Topaz e) Emerald f) Aquamarine g) Pearls h) Zircon

Semi precious varieties: a) star ruby b) star sapphire c) Spinels d) Garnets- different varieties e) Malachite f) Lapislazuli g) Turquoise h) Moonstone g) tiger's eye.

Synthetic gemstones and its importance, gem cutting techniques.

7 hrs

UNIT-2

OPTICAL MINERALOGY (Petrographic techniques)

Refractive index, Critical angle, Total reflection. Double refraction- Isotropic and Anisotropic crystals, Polarisation of light, Polaroids, Behaviour of light under crossed nicols with mineral section.

7 hrs

UNIT-3

OPTICAL ACCESSORIES: Mica plate, Gypsum plate and Quartz wedge (construction and use). Pleochroism (Dichroism, Trichroism) Interference colours, Michael Levy's chart. Order of Interference colour, Extinction- Straight, inclined, undulose and symmetrical extinctions. Extinction angle.

7 hrs

UNIT-4

HYDROGEOLOGY

Hydrologic cycle. Ground Water – Introduction, origin, types, occurrence, movement of ground water, distribution of ground water in the earth's crust, global water balance, vertical distribution of ground water- water table and its fluctuation- springs and artesian wells. Darcy's law and its application. Hydrologic properties of rocks: Porosity; permeability; specific yield; specific retention, hydraulic conductivity, transmissivity, storage coefficient. Water bearing geologic formations – Aquifers (confined, unconfined & perched), aquiclude, aquifuge, aquitard.

7 hrs

UNIT-5

Physical, chemical and biological properties of groundwater, drinking water standards. Groundwater pollution and its causes. Methods of groundwater conservation and management . Rain water harvesting.

7 hrs

UNIT-6

MINING GEOLOGY

Introduction and terminology for mining, methods of mining, mining of metalliferous deposit, surface and subsurface mining. Mine safety, mine ventilation, advantages and disadvantages of surface and subsurface mining. Ore reserve estimation and its methods. Impact of mining and mineral processing on environment and human health.

7 hrs

Total 42 hrs

Books:

1. Gems and Gem Materials - Kvans, E.H. & Slawson, S.B.
2. Gemstones - Smith, H.
3. Gems - Webster, R.
4. Gems and Gem Industry in India – R.V. Karanth
5. Gemstones-Enchanting Gifts of Nature – R.V. Karanth
6. Navarathnagalu - Prasaranga Publication, Mys.Univ.
7. Environmental Geology & Conservation, Land use planning and Resource Management – Peter T. Flawn
8. Environmental Geography – Savindra Singh
9. Groundwater Hydorlogy - D. K. Todd
10. Hydrology - S. N, Davis and R.J.M. Dewiest
11. Groundwater - C. L. Tolman
12. Groundwater studies - R. H. Brown and Ahers
13. Groundwater Hydrology - Hermann Bouver
14. Hydrology - C. W. Fetter
15. Principles of Mining Geology-Arogya Swamy.
16. Hydrology - Raghunath
17. Hydrology – Karanth
18. Indian Mineral Resources - Krishnaswamy, S and Sinha..
19. Metallic and Industrial minerals - Lamey, G.A.
20. Introduction to India's economic minerals - Sharma, N.L. and Ram. K.S.

PRACTICAL (PR VII): PETROGRAPHIC TECHNIQUES-I

	Th	IA
Prac. 3h/week	40	10

Optical mineralogy:

Petrological microscope: parts and its accessories
Determination of the following optical properties.
Pleochroic scheme, sign of elongation, order of interference colors.
Extinction angles.
Identification of the following rock forming minerals under the microscopic quartz, feldspars, micas, olivine, augite, hornblende, hypersthene, calcite, garnet.

Total 14 Practicals

PRACTICALS (PR VIII): PETROGRAPHIC TECHNIQUES-II AND ORE GEOLOGY

Th IA

Prac 3h/week 40 10

Igneous rocks: granite, syenite, diorite, gabbro, Dunite, phorphyries, pegmatite, dolerite, rhyolite, trachyte, basalt.
Sedimentary rocks: sandstone, arkose, limestone (oolitic)
Metamorphic rocks: quartzite, schist, gneiss, marble, charnockitic granulites and basic granulite.

Study and identification of the following economic minerals based on physical properties:

Native copper, graphite, sulphur, chalcopyrite, azurite and malachite, realgar and orpiment, cinnabar, cassiterite, stinnite, Galena, Sphalerite, pyrite, hematite, magnetite, limonite, pyrolusite and psilomelane, bauxite illiminite, wolframite, chromite.
Fossil fuels: coal and its varieties.

Total 14 Practicals

10 marks is allotted for field work and report
Brief note on taking geologic notes in the field. Collection of samples, numbering and marking speciments. Use of compass and clinometers in the field and determination of strike and dip of rocks. Use of topographic maps and geologic maps. Selecting and preparing a base map.
Plotting geologic features on a base map. Locating field data on a base map. Mapping by the outcrop or exposure method preparing geological reports.

FIELD WORK: Field work for minimum of three days accompanied by staff members should be arranged during sixth semester. Submission of field report by students is compulsory. The actual TA/DA for accompanying staff members should be borne by the college from E.C. funds or other heads.

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Model Question Paper - Theory

CODE I/II/III/IV SEMESTER B.Sc., DEGREE EXAMINATION

GEOLOGY

Time: 3 hours **Paper-I: TITLE** max marks: 60

INSTRUCTIONS TO CANDIDATES

1. Answer all question
2. Draw labeled diagrams wherever necessary.

I.Simple answer question:

Answer the following in a word or a phrase or a sentence 7X1=7 marks

1.

2.

3.

4.

5.

6.

7.

II. Short answer question:

Answer any **FIVE** of the following 5X3=15 marks

8.

9.

10.

11.

12.

13.

14.

III. Medium answers questions:

Answer any **THREE** of the following 3X6=18 marks

15.

16.

17.

18.

19.

IV. Long answer questions:

Answer any **TWO** of the following: 2X10=20 marks

20.

21.

22. Explain

a).

b).

Model Question Paper - Theory

CODE V/VI SEMESTER B.Sc., DEGREE EXAMINATION

GEOLOGY

Time: 3 hours **Paper-: TITLE** max marks: 80

INSTRUCTIONS TO CANDIDATES

1. Answer all question
2. Draw labeled diagrams wherever necessary.

I.Simple answer question:

Answer the following in a word or a phrase or a sentence 7X1=7 marks

1.

2.

3.

4.

5.

6.

7.

II. Short answer question:

Answer any **SIX** of the following 6X3=18 marks

8.

9.

10.

11.

12.

13.

14.

15.

III. Medium answers questions:

Answer any **FIVE** of the following 5X5=25 marks

16.

17.

18.

19.

20.

21.

22.

IV. Long answer questions:

Answer any **THREE** of the following: 3X10=30 marks

23.

24.

25.

26. Explain

a).

b).

Model Question Paper – Practical
I SEMESTER
PRACTICAL PAPER I : CRYSTALLOGRAPHY

Time : 2 hrs. Paper code A 542 Max. Marks: 20

1. Measure the interfacial angle of the given crystals kept in tray Nos. 1 & 2. 2 X 2=4
2. Verify the Euler's formula for the given crystal models kept in tray Nos. 3 & 4. 2 X 2=4
3. Describe and identify the crystal models kept in tray Nos. 5 to 8. 4 X 3=12.

Model Question Paper – Practical
II SEMESTER
PRACTICAL PAPER II : MINERALOGY

Time : 2 hrs. Paper code B 542 Max. Marks: 20

1. Describe and identify the minerals kept in tray Nos. 1 to 10. 10 X 2= 20.

Model Question Paper – Practical
III SEMESTER
PRACTICAL PAPER III : PETROLOGY

Time : 2 hrs. Paper code C 542 Max. Marks: 20

1. Describe and identify the rock kept in tray Nos. 1 to 10. 10 X 2= 20.

Model Question Paper – Practical
IV SEMESTER
PRACTICAL PAPER IV : PALAEONTOLOGY

Time : 2 hrs. Paper code D 542 Max. Marks: 20

1. Describe and identify the animal fossils kept in tray Nos. 1 to 5. 5 X 3= 15.

2. Describe and identify the plant fossils kept in tray Nos. 9 & 10. 2 X 2½= 5.

Model Question Paper – Practical
V SEMESTER
PRACTICAL PAPER V : STRUCTURAL GEOLOGY

Time : 3 hrs. Paper code E 544 Max. Marks: 40

1. Draw the section of the given geological/structural map and give your interpretation.
4 X 10 = 40 Marks

Model Question Paper – Practical
V SEMESTER
PRACTICAL PAPER VI : TRACING OF OUTCROPS, DIP AND STRIKE PROBLEMS

Time : 3 hrs. Paper code E 546 Max. Marks: 40

1. Completion of outcrop 2 Nos. 2 X 5 = 10 Marks
2. Calculate the thickness /WOC of the strata by using geometric and mathematical methods. 2 problems 2 X 5 = 10 Marks
3. Dip and Strike Problems 4 problems 4 x 5 = 20 Marks

Model Question Paper – Practical
VI SEMESTER
PRACTICAL PAPER VI : PETROGRAPHIC TECHNIQUES-I

Time : 3 hrs. Paper code F 90 Max. Marks: 40

1. Determination of any two from the following (with procedure):

2 X 15 = 30 Mark

   i. Order of Interference colour
   ii. Extinction angle.
   iii. Sign of elongation
   iv. Pleochroic scheme.

3. Identification of any two rock forming minerals in thin sections. 2 X 5 = 10 Mark

Model Question Paper – Practical
VI SEMESTER
PRACTICAL PAPER VI : PETROGRAPHIC TECHNIQUES-II AND ORE GEOLOGY AND FIELD REPORT

Time : 3 hrs. Paper code F 91 Max. Marks: 40

1. Identification and description of rocks in thin section: 6 X 4 = 24 Mark
   One section each from Plutonic, Hypabyssal, volcanic rocks
   One section from sedimentary rock and
   Two sections from metamorphic rocks.
2. Identification and description of ore minerals 3 X 2 = 6 mark
3. Field work report submission, evaluation and viva-voce 10 mark