UNIVERSITY OF MYSORE

GRADUATE COURSES – SEMESTER SCHEME

2008 – 2011

B.Sc., GEOLOGY

SYLLABUS

UNIVERSITY OF MYSORE

SUBJECT- GEOLOGY

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 Earth; Nebular hypothesis. 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- pedestral 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 hrs

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, paleomagnetism, 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 Tectosilicates.

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.

Oxides: corundum, Corundum, Halides; Fluorite, Halite, Carbonates: Calcite, Magnesite, Siderite, Rhodochrosite, Dolomite, Phosphates: Monazite, Apatite, Sulphates; Barytes, Gypsum.

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, Phlogopite, Biotite, Epidote, Chlorite, Tectosilicates; Quartz and its varieties, Feldspars- Microcline, Orthoclase, Plagioclase- varieties Feldspathoids- Leucite, Nephelene, Sodalite

Total 14 hrs

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, basallic, 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, parent 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.
3. Metamorphic petrology by Winkler HGF 1987 - Nirosa publications
4. Sedimentary rocks by Pettijohn 1984 - CDS Pub\. NEW DELHI
5. Sedimentary rocks by Greensmith 1984
6. Manual of sedimenlary petrology - Krymbein & Pettijohn
7. Petrology of Sedimentary rocks - Folk. R.L.
8. 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: megascopic study

Igneous rocks: Granite, Syenite, Diorite, Gabbro, Peridotite, Dunite, Porphyries, Granite, Syenite, Diorite, Aplite, 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 hrs

FOURTH SEMESTER

Paper-4. 3

PRINICIPELS OF PALEONTOLOGY AND STRATIGRAPHY, FOSSIL FUELS, ENGINEERING GEOLOGY

	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.

7hrs

UNIT - 2

Fossil fuels: Petroleum & Coal: Petroleum – origin. Migration and accumulation of Oil. Oil traps, On-shore and off-shore oil fields of India. Coal – stages and periods of coal formation, lower Gondwana coal fields, peat and Lignite deposits.

7hrs

UNIT -3

Engineering Geology

Geology of Bridge site and Reservoirs; Water supply; stability of hill slopes and cuttings.

7 hrs

UNIT -4

Geology of Bridge site; Geology of Tunnel sites; Building stones; Road Materials.

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, Paleozoic, 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. Vertebrate Paleontology- Romer A.
7. Vertebrates-Colbert C
8. Geology for engineers – Blyth F.G.H
9. Physical and Engineering Geology – S.K.Garg
10. A text book of geology- P.K.Mukherjee

PRACTICAL (PR IV) : PALEONTOLOGY,FOSSIL FUELS, ECONOMIC MINERALS

	Th	IA
Prac. 3 hrs/week	20	10

Forms of fossil : Cast, Mould, Petrification., Petrified wood, Silic fication, Carbonisaton.

Drawing, Labeling, Description and Identification with geological age of the following plant fossils.
Plant fossils : Lepidodendron, Sigillaria, Calamites, Glossopteris, Ptillophyllu.

Economic Minerals:
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, Sphaleritr, Pyrite,Hematitte, magnetite, Limonite, Pyrolusite and Psilomelane.

Fossil Fuels
Coal and its Varities.

Total 14 hrs

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 basins of Karnataka, 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, lithology , distribution, classification, brief account of fossil record and age limits.

7 hrs

UNIT-3

Deccan traps- Lithology, Distribution, lametas, infra, inter,supra-trappeans, Age of Deccan traps-based on Siwaliks : Lithology, Distribution, Calssfication, Life and age of Siwaliks, Recent Allluvium.

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7hrs

STRUCTURAL GEOLOGY

UNIT-4

Introduction: structural geology and its importance.Concept of deformation.

Forces - tensional, torsional. shearing and compressional, Structures; Primary and Secondary – Definition. Conformity, unconformity-definition-origin-types-disconfirmity, nonconformity and angular unconformity: recognition and significance. 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. Types of 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.

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

Faults Definition –Elements of faults, Fault planes, Dip, Stike, Hade, Heave and Throw, Hangining and Foot walls.

7 hrs

UNIT-6

Classification of faults.

Geometrical : Based on attitude of faults as compared to the adjacent beds, Dip, Strike, Diagonal faults, Based on Apparent movement, normal and reverse faults,

Genetic Thrust faults , over thrust, and under thrust Gravity faults – Steps fault, Ridge faults, trough faults, criteria for recognition of faults in the fields.

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 ORE GEOLOGY AND INDIAN MINERAL DEPOSITS

		Th	IA
Ore Geology	Theory 3hr/week	80	20

UNIT-1:

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.

7 hrs

UNIT-2

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

7 hrs

UNIT-3:

Weathering processes: Residual, mechanical concentrations (placers) alluvium, Strea and marine Deposits, Sedimentation: Fe and Mn cycles, Oxidation and supergene enrichment: Gossans.

7 hrs

UNIT-4:

Metamorphism: Metamorphic deposits

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

7 hrs

Indian Mineral Deposits

UNIT-5

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, Aluminum, Chromium

7 hrs

UNIT-6

Non-metallic deposits: Mica, Abrasives, Refractories, Building and Ornamental stones

Non-conventional energy resources wind solar, geothermal energy resources.

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.

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 hrs

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 hrs

SIXTH SEMESTER

Paper 6.1 REMOTE SENSING AND GEOEXPLORATION

	Th	IA
Theory 3hr/week	80	20

UNIT-1

Remote sensing using aerial photograph :

Introduction to aerial photography and remote sensing , parts of 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

Remote sensing using satellite imagery

Basic Principles- electro magnectic spectrum –plat forms –capabilities active and passive sensors and scanners.

7 hrs

UNIT-3

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

GEOEXPLORATION

UNIT-4

Principles of exploration : Geological , geophysical and geochemical methods. Guides for locating ore deposits.

7 hrs

UNIT-5

Regional guides and their importance, Physiographic, Structural, Stratigraphic and mineralogical guides.

7 hrs

UNIT-6

Geophysical prospecting : Electrical methods in ground water investigations. Geochemical exploration and Bio-geochemical exploration.

7 hrs

Books:

1. Introduction to photogrammetry by Wolf
2. Photogeology – Miller.J.C
3. Principles and Interpretation of Aerial Photography by D. R Lend.
4. Photogeology by S.L Pandey
5. Principles of remote Sensing A.N. Patel and Sunrendra Singh
6. Basic Petroleum Geology – Link P.K
7. Coal – More D.C

Paper 6.2 GEMOLOGY, OPTICAL MINERALOGY, HYDROGEOLOGY AND MINING GEOLOGY

	Th	IA
Theory 3hr/week	80	20

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

7 hrs

UNIT-2

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-3

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-4

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-5

HYDROGEOLOGY

Hydrologic cycle . Definition and origin 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 artsian wells.
Darcy's law and its application Aqyifers and its classifications. Hydrological properties of rock.

7 hrs

UNIT-6

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

Books:

1. Gems and Gem Materials - Kvans, E.H. & Slawson, S.B.
2. Gemstones - Smith, H.
3. Gems - Webster, R.
4. Navarathnagalu - Prasaranga Publication, Mys.Univ.
5. Optical Mineralogy _ Naidu P.R.J
6. Optical Mineralogy – Kecr P.F
7. Optical Crytallography – Wahlstrom E.E
8. Ground Water Hydrology – D.K Todd

9. Hydrology – S.N Davis and R.J.M Dewiest
10. Groundwater -C.L Tolman
11. Groundwater studies – R.H. Brown and Ahers
12. Groundwater Hydrology – Hermann Bouver
13. Hydrology –C.W. Fetter
14. Hand book and applied Hydrology - Ven Te Chew
15. Hydrology – Raghunafh
16. Hydrology - Karanth

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 hours

PRACTICALS (PR VIII): PETROGRAPHIC TECHNIQUES-II

	Th	IA
Prac 3h/week	40	10

Microscopic identification of the following rocks :
Igneous rocks: granite, syenite, diorite, gabbro, Dunite, phorphyries, pegmatite, dolerite, rhyolite, trachyte, basalt.
Metamorphic rocks: Quartzite, Schist, Gneiss, Marble, Charnockitic ,Granulites and basic granulite.
Sedimentary rocks: Sandstone, Arkose, Limestone (oolitic)

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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