कोल्हान विश्वविद्यालय, चाईबासा

KOLHAN UNIVERSITY, CHAIBASA

भूगर्भशास्त्र

University Department of Geology

CBCS Syllabus Of B.Sc. Hons. Programme

(Semester System)

W.E.F Session 2017-19

SEM.. I
CORE COURSE GEOLOGY
PAPER – I C-1
EARTH SYSTEM SCIENCE
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Earth as a planet

- Holistic understanding of dynamic planet "Earth' through Geology.
- Introduction to various branches of Geology.
- General characteristics and origin of the Solar System and its planets.
- Elementary idea about the terrestrial and Jovian planets, Meteorites and Asteroids.
- Earth: origin, size, shape, mass, density, rotational and revolution parameters and its age.

UNIT 2 : Earth's magnetic filed

- Internal Structure of the earth.
- Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere.
- Earth's magnetic filed: Convention in Earth's core and production of its magnetic filed.

UNIT 3 : Plate Tectonics

- Concept of plate tectonics, sea-floor spreading and continental draft.
- Geodynamic elements of Earth: elementary concepts of Mid Oceanic Ridges, trenches, transform faults, rift valleys and island arcs.
- Origin of oceans, continents and mountains.
- Earthquake and earthquake belts.
- Volcanoes: types, products and distribution.

UNIT 4 : Hydrosphere and Atmosphere

- Oceanic current system and effect of coriolis forces. Concept of eustasy,
- Atmospheric circular: weather and climatic changes.
- Earth's heat budget.

UNIT 5 : Soil

- Soils: processes of formation, soil profile and soil types.

UNIT 6 : Understanding the past from stratigraphic records

- Stratigraphy: Introduction and Scope.
- Standard stratigraphic time scale and introduction to the concept of time in geological studies.
- Principles of Stratigraphiy: History of development in concepts of uniformitarianism, catastrophism and neptunism. laws of superposition and fannual succession.
- Intruduction to geochronological methods in their application in geological studies.

UNIT 7 : Cosmic adundance of elements

- Distribution of elements in the solar system and in the Earth
- Chemical differentiation and composition of the Earth.
- Introduction to properties of elements: the periodic table, Chemical bonding, states of matter and atomic environment of elements.

PRACTICAL:

- Plotting of Contour maps and identification and description of important topographical features.
- Study of Topographic Sheets: Tracing of contours and drainage network.
- Plotting of major Stratigraphic units on the outline map of India.
- Plotting of major Dams on the outline map of India; mention name of the river and utility of the dam.
- Study of Seismic Zones of India.

SUGGESTED READINGS:

1. Holme's Principles of Physical Geology. 1992. Chapman & Hall.
2. Emiliani, C, 1992. Planet Earth, Cosmology, Geology and the Evolution of Life and Environment. Cambridge University Press.
3. Gross, M.G., 1977. Oceanography: A view of the Earth, Prentice Hall.

CORE COURSE: GEOLOGY
PAPER – II C-2
CRYSTALLOGRAPHY AND MINERALOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Crystallography

- Elementary ideas about crystal morphology in relation to internal structures: Crystal forms, Crustallographic axes and its orientation.
- Concepts of Parameter System of Weiss and index System of Miller.
- Laws of Crystallography: Constancy of Interfacial angle, rational indices and Crystal Symmetry.
- Classification of crystals into six system: Study of Symmetry elements and forms of the Nomal Classes

UNIT 2 : Crystal symmetry and projections

- Elements of crystal chemistry and aspects of crystal structures.
- Stereographic projections of symmetry elements and forms.
- Introduction to analytic techniques like XRD (X-ray diffraction), SEM (scanning electron microscopy).

UNIT 3 : Rock forming minerals

- Minerals: Definition and classification and physical properties of common rock forming minerals.
- Silicate Structures.
- Systematic Classification, Chemiscal Composition, Atomic Structure and Mode of occurrence of Following Group of Minerals: Olivine, Quartz, Felspar, Pyroxene, Amphibole, Garnet, Felspathoid and Mica.

UNIT 4 : Properties of light and optical microscopy

- Nature of light and principles of optical mineralogy.
- Optical characters of minerals: Pleochroism, Extinction angle, Interference Color etc.
- Properties of common rock forming minerals in thin section.

PRACTICAL:

- Observation and documentation of symmetry elements of crystals.
- Mohs' Scale of Hardness: Study and Documentation.
- Study of Physical properties of minerals in hand specimen: Olivine Garnet, Andalusite, Sillimanite, Kyanite, Staurolite, Beryl, Tourmaline, Augite, Actinilite, Tremol;ite, Hornblenede, Serpentine, Talc, Muscovite, Biotite, Phlogopite, Quartz, Orthoclause, Plagioclase, Microcline, Nepheline, Sodalite, Zeolite, gypsum, Calcite, fluorite, Apatite, Topaz Corundum, Quartz cariets: Chert, Flint, Chalcedony, Agate, Jasper, Amethyst, Rose qusrtz, Smoky Quartz, Raock crystal.

- Obeservation of following minerals under optical microsopce and study their characteristic properties: Quarttz, Microcline, Plagioclase, Biotite, Muscovite, Hornblende, Augite, Hypersthene, Olivine, Garnet.

SUGGESTED READINGS:

1. Cornels Klien and Barbara Dutrow, 2007 The manual of Mineral Science, wiley Publication.
2. P.F. Kerr 1959 Optical Meniralogy, Ms Graw Hill
3. P.K. Verma, 2009 Optical mineralogy, CRC press
4. Deer, W.A. Howei, R.A. and Aussman, J., 1996 An introduction to the rock forming minerals, Prentice-Hall.

SEM: II
CORE COURSE GEOLOGY
PAPER – III C-3
ELEMENTS OF GEOCHEMISTRY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Concepts of geochemistry

- introduction and Scope of Geochemistry.
- General concepts about geochemical cycles and mass balance.
- Geochemical classification of elements.

UNIT 2 : Layered structure of Earth and geochemistry

- Composition of different Earth reservoirs.
- Concept of radioactivity, radiogenic isotopes in geochronolgy and isotopic tracers: dating by radioactive nuclides, Carbon 14, Rb – Sr, K-Ar methods: radiogenic tracers.

UNIT 3 : Element transport

- Advection, diffusion.
- Chromatography, Aqueous geochemistry: basic concepts.

UNIT 4 : Layered structure of Earth and geochemistry

- The solid Earth – geochemical variability of magma.
- Melting of the mantle and growth of continental crust.
- Meteorites.

Unit 5 : Geochemical behavior of selected elements like Si, Al, K, Na etc.

PRACTICAL

- Use of common geochemical plots
- Normalization of geochemical data.
- Common bi-variate and tri-variate plots.

SUGGESTED READINGS:

1. Mason, B (1986). Principles of Geochemistry. 3rd Edition, Wiley New York.
2. Hugh Rollinson (2007) Using geochemical data – evalution, presentation and interpretation. 2nd Edition. Publisher Longman Scientific & Technical.
3. Walther John, V., 2009 Essentials of geochemistry, student edition. Jones and Bartlett Publishers.
4. Albarede, F., 2003. An introduction to geochemistry. Cambridge University press.

CORE COURSE: GEOLOGY
PAPER – IV C-4
PRINCIPLES OF STRUCTURAL GEOLOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Structure and Topography

- Basic concepts of Bed and bedding Plane, Dip and Strike.
- Effects of Topography on structural feature.
- Topographic and structural maps: Important of scale of the map.

UNIT 2 : Stress and strain in rocks

- Concept of rock deformation: Stress and Strain in rocks, Strain ellipses of different types and their geological significance.

UNIT 3 : Folds

- Fold morphology; Geometric and genetic classification of folds.
- Introduction to the mechanics of folding: Flexural slip, Shear and flow folding.

UNIT 4: Foliation and lineation

- Description, origin and classification of foliations.
- Description and origin of lineation and relationship with the major structures.

UNIT 5 : Joints and faults

- Geometric and Genetic classification of joints and faults.
- Effects of Faulting on the outcrops.
- Geologic and Geomorphic criteria for recognition of Faults.

UNIT 6 : Orogeny and Neotectnics

- Concept of orogeny and Neotectonics with Examples.

PRACTICALS:

- Introduction to Geological maps: lithological and structural maps.
- Drawing profile sections and interpretation of geological maps of different complexities: unconformities, Fold and fault.
- Solving 3-points problems of Dip and Strike
- Solving Structural Problems using Geometric method and Stereographic Projection Method.

SUGGESTED READINGS:

1. Davis, GR. 1984. Struntural Geology of Raocks and Region. John Wiley.
2. Billings, M.P. 1987. Structural Geology, 4th edition, prentice-Hall
3. Park, R.G. 2004. Foundations of Structural Geology. Chapman & Hall.
4. Pollard, D.D. 2005. Fundamental of Structural Geology. Cambridge University Press.
5. Ragan, D.M. 2009. Structural Geology: an introduction to geometrical techniques (4th Ed.) Cambridge university Press (For practicals)

SEM: III
CORE COURSE GEOLOGY
PAPER – V C-5
IGNEOUS PETROLOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Concepts of igneous petrology

- Introduction to petrology : heat flow, geothermal gradients through time and nature of magma.

UNIT 2 : Classification and texture

- Classification of igneous rocks.
- Forms of extrusive and intrusive rocks.
- textures and structures of igneous rocks.

UNIT 3 : Phase diagrams and magma geochemistry

- Phase diagrams in understanding crystal-melt equilibrium: Uni component, bicomponent and ternary Systems.
- Bowen's reaction Series.
- Magmatic differentiation and Assimilation.
- Magma generation in crust and mantle, their emplacement and eruption processes.

UNIT 4 : Magmatism in Different tectonic setting I

- Basic concept about Magmatism in the oceanic domains (MORB, OIB)
- Basic concepts about magmatism along the plate margins (Island arcs/constinental arcs)

UNIT 5 : Magmatism in different tectonic setting II : Basic Concepts

- Ophiolites and layered complexes .
- Arhhean magmatism (CFB, alkaline rocks and kimberlites)

PRACTICALS:

- Study of various intrusive bodies.
- Megascopic study of important igneous rocks.
- Study of important igneous rocks in thin section: granite, granodiorite, diorite, gabbro, anothositesm ultramafic rocks, basalts, andestes, teachyte, rhyolite, dacite, schists and amphibolites.
- Plotting of major and trace element data on binary and triangular diagrams.

SUGGESTED READINGS:

1. Principles of Igneous and Meramorphic Petrology by Anthony R. Philphots and Jay J. Ague. Second Edition, Cambridge university press.
2. An Introdcution to Igenous and Metamorphic Petrology by John. D. Winter Prentice Hall.
3. Using Geochemical Dat: evaluation, presentation and interpretation by Hugh Pollinson. Longman Scientific and Technical.
4. The Study of Igneous, Sedimentary and Meta morphic rocks by Loren A. Raymond McGraw Hill.

CORE COURSE: GEOLOGY
PAPER – VI C- 6
SEDIMENTOLOGY AND PRINCIPLES OF STRATIGRAPHY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Origin of sediments

- weathering : Physical and chemical weathering, soils and paleosols.

UNIT 2 : Fluids; particle-fluid interaction, flows

- Fluid flow and sediment transport : types of fluids, Laminar vs. turbulent flow, Particle entrainment, transport and deposition.
- Concept of flow regimes and bedforms, sediments gravity flows.

UNIT 3 : Sediment Granulometry

- Sedimentary texture : Grain size scale, particle size distribution, Environmental connotation; particle shape and fabric.

UNIT 4 : Sedimentary structures

- Structure of Sedimentary Rocks: primary and Secondary sedimentary structures.
- Basic concepts of Paleocurrent analysis.

UNIT 5 : Varieties of sedimentary rocks

- Siliciclastic rocks: origin and Classification of Sandstone.
- Petrographic description of Conglomerates, sandstones and mudrocks.
- Carbonate rocks. controls of carbonate deposition, components and classification of limestone, dolomite and dolomitisation.

UNIT 6 : Diagenesis

- Concept of diagenesis.
- Stage of diagenesis; Compaction and cementation.

UNIT 7 : Principles of stratigraphy

- Fundamental of litho-bio-and chronmostratigarphy
- Introdcution to concepts of dynamic stratigraphy (Chemostratigraphy, seismic stratigraphy, sequence stratiggraphy, Magneto, Strtigraphy)

PRACTICALS:

- Observation and documentation of important Sedimentary Structures.
- Study of Sedimintary textures in hand specimen and in thin section: grain size and Shape.
- Plotting of Ruse Diagram for Paleocurrent analysis.
- Exercises based on vertical sedimentary sequence of different terrestrial, coastal and marine environments.
- Petrography of clastic and non-clastic rocks through hand specimens and thin sections.

SUGGESTED READINGS:

1. Prothero and Schwab, 2004, Sedimentary Geology, Freeman and Co. New York, 557p.
2. Maurice E. Tucker, 2006 Sedimentary Petrology, Blackwell Publishing, 262p.
3. Colinson, J.D. and Thompsom, D.B. 1988, Sedimentary structures, Unwin-Hyman, London, 207p.
4. Gray Nichols, 2009. Sedimentary and stratigraphy Second Edition. Wiley Blackwell.

CORE COURSE: GEOLOGY
PAPER – VII C- 7
PALEONTOLOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

UNIT 1 : Fossilization and fossil record

- Nature and important of fossil record; Fossilization processes and modes of preservation.

UNIT 2 : Taxonomy and Speecies concept

- Species concept with special reference to palaeopntology.
- Taxonomic hierarchy
- Concept of organic evolution

UNIT 3 : Invertebrates

- Morphology, Classification and geological history of following Groups: Bivalavia, Gastropoda, Brachiopoda.
- Functional adaptation in trilobites and ammonoids.

UNIT 4 : Ichnology

- Trace fossils and their classifications.
- Application of ichnology in paleoenvironmental reconstruction.

UNIT 5 : Vertebrates

- origin of vertebrates and major steps in vertebrate evolution.
- Mesozoic reptiles with special reference to origin and extinction of dinosaurs.
- Evolution of Horse and intercontinental migrations.
- Human evolution.

UNIT 6 : Paleobotany

- Early plant life, first land plants, vascular plants and brief idea about Gondwana flora.

UNIT 7 : Microfossils and Palynology

- Introduction to microfossils and Palynofossils and their application.

UNIT 8 : Application of fossils

- Application of fossils in biostratigraphy, biozones, index fossils, correlation.
- Role of fossils in sequence stratigraphy.
- Fossils and palaeoenvironmental analysis.

PRACTICALS:

- Study of fossils showing various modes of preservation.
- Study of diagnostic morphological character, systematic position, stratigraphic position and age of various invertebrate, vertebrate and plant fossils.
- Drawing and labeling of important fossils.

SUGGESTED READINGS:

1. Raup, D.M. & Stanley, S.M. W.H. Freeman, 1971 Principles of Palaeontology
2. Clarkson, E.N.K. 201 Invertebrate palaentology and evolution 4th Edition by Blackwell.
3. Benton, M.J. Blackwell, 2005 Vertebrate palaeontology.
4. Mishra & Shukal 1982. Essentials of Palaeonbtany Vikas Publisher.
5. Armstrong, H.A., and Brasier, M.D., 2005. Microfossils Blackwell.

SEMESTER -IV
CORE COURSE: GEOLOGY
Paper – VIII
METAMORPHIC PETROLOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

Unit 1: Metamorphism: controls and types

- Definition of metamorphism.
- Factors controlling metamorphism.
- Types of metamorphism – contact, regional, fault zone metamorphism, impact metamorphism.

Unit 2: Metamorphic Zone, Facies and Grades

- Index minerals
- Chemographic projection: ACF, AKF diagrams
- Metamorphic zones and isograde.
- Mineralogical phase rule.
- Structure and Texture of metamorphic rocks

Unit 3: Metamorphism and Tectonism

- Relationship between metamorphism and deformation
- Metamorphic Differentiation.

Unit 4: Migmatites:

- Origin of migmatities
- Metasomatism, Role of fluids in metamorphism

Unit 5: Petrographic description : Marble, Quartzite, Schists, gneisses, khondolites, charnokites, Amphibolite and eclogites.

PRACTICAL:

- Megascopic and microscopics study (textural and mineralogical) of the representative meiamorphic rocks.
- Laboratory exercises in graphic plots for Petrochemistry.

SUGGESTED READINGS:

1. Anthony R. Philphots and Jay J. Ague Principles of Igneous and Metamorphic Petrology Second Edition, Cambridge University Press.
2. John D. Winter. An Introduction to Igneous and Metamorphic Petrology Prentice Hall
3. Hugh Rollinson Using Geochemical Data: evaluation, presentation and interpretation Longman Scientific and Technical.
4. Loren A. Raymond The study of Igneous, Sedimentary and Metamorphic rocks McGraw Hill
5. Introduction to metamorphic petrology by B.W.D Yardley

CORE COURSE: GEOLOGY

Paper – IX

INDIAN STRATIGRAPHY

(CREDITS: THEORY-4, PRACTICALS-2)

THEORY

LECTURES:

Unit 1: Code of stratigraphic nomenclature:

- International Stratigraphic Code – development of a standardized stratigraphic nomenclature.
- Concepts of Stratotypes. Global Stratotype Section and Point (GSSP).

Unit 2: Facies concept in stratigraphy

- Walther's Law of Facies.
- Concept of paleogeographic reconstruction

Unit 3: Physiographic and tectonic subdivisions of India

- Brief introduction to the physiographic and tectonic subdivisions of India.
- Introduction to Indian Shield
- Introduction to Proterozoic basins of India
- Geology of Vindhyan and Cudappah Successions of India

Unit 4: Palaeozoic – Mesozoic Succession of type areas

- Stratigraphy, structure and hydrocarbon potential of Gondwana basins.
- Mesozoic stratigraphy of India:
    a. Triassic successions of Spiti
    b. Jurassic of Kutch
    c. Cretaceous successions of Cauvery basins

Unit 5: Cenozoic succession of type areas

- Cenozoic stratigraphy of India:
    a. Siwalik successions
    b. Assam and Arakan basins.

- Stratigraphy and structure of Krishna-Godavari basin, Cauvery basin, Bobmay offshore basin, Kutch and Saurashtra basins their potential for hydrocarbon exploration:

Unit 6: Volcanic provinces of India

a. Deccan b. Rajmahal Trap

Unit 7:A brief idea about Stratigraphy of Jharkhand

Unit 8: Stratigraphic boundaries

- Important Stratigraphic boundaries in India
    a. Precambrian-Cambrian boundary
    b. Permian-Triassic boundary
    c. Cretaceous-Tertiary boundary

PRACTICAL:

- Study of geological map of India and identification of major stratigraphic units.
- Study of rocks in hand specimens from known Indian stratigraphic horizons
- Exercise showing the major Stratigraphic and tectonic units in outline map of India.
- Study of different Proterozoic supercontinents reconstructions.

SUGGESTED READINGS:

1. Krishnan, M.S. 1982. Geology of India and Burma, CBS Publishers, Delhi
2. Doyle, P. & Bennett, M.R. 1996. Unlocking the Stratigraphic Record. John Wiley
3. Ramakrishnan, M. & Vaidyanadhan, R. 2008. Geology of India Volumes 1 & 2, geological society of India, Bangalore.
4. Valdiya, K.S. 2010. The making of India, Macmillan India Pvt. Ltd.

CORE COURSE: GEOLOGY

Paper – X

HYDROGEOLOGY

(CREDITS: THEORY-4, PRACTICALS-2)

THEORY

LECTURES:

Unit 1: Introduction and basic concepts

- Scope of hydrogeology and its societal relevance.
- Hydrologic cycle: precipitation, evapo-transpiration, runoff, infiltration, subsurface movement of water.
- Rock properties affecting groundwater.
- Vertical distribution of subsurface water.
- Types of aquifer, aquifer parameters, anisotropy and heterogeneity of aquifers.

Unit 2: Groundwater flow

- Darcy's law and its validity.
- Intrinsic permeability and hydraulic conductivity.
- Groundwater flow rates and flow direction.
- Laminar and turbulent groundwater flow.

Unit 3: Water Wells

- Test holes and well logs.
- Methods for constructing shallow and deep wells.
- Well completion and well development.

Unit 4: Groundwater exploration

- Basic concepts: use of remote sensing and GIS in groundwater exploration.
- Surface based groundwater exploration methods.

Unit 5: Groundwater chemistry

- Physical and chemical properties of water and water quality.
- Sea water intrusion in coastal aquifers.

Unit 6: Geological formations as aquifers

- Groundwater occurrence in igneous, metamorphic and sedimentary rocks.
- Groundwater in non-indurated sediments.
- Groundwater provinces of India.

Unit 7: Groundwater management

- Surface and subsurface water interaction.
- Groundwater level fluctuations.
- Basic concepts of water balance studies, issues related to groundwater resources development and management.
- Rainwater harvesting and artificial recharge to groundwater.
- Basic concepts of Watershed Management.

PRACTICAL:

- Preparation and interpretation of water level contour maps and depth to water level maps
- Study, preparation and analysis of hydrographs for differing groundwater conditions.
- Water potential zones of India (map study).
- Graphical representation of chemical quality data.
- Simple numerical problems related to: determination of permeability in field and laboratory, Groundwater flow, Well hydraulics etc.

SUGGESTED READINGS:

1. Todd, D.K. 2006. Groundwater hydrology, 2nd Ed., John Wiley & Sons, N.Y.
2. Davis, S.N. and Weist, R.J.M. 1966. Hydrogeology, John Wiley & Sons Inc., N.Y.
3. Karanth K.R. 1987, Groundwater: Assesment, Development and management, TataMcGraw-Hill Pub. Co. Ltd.

SEM - V

CORE COURSE: GEOLOGY

Paper – C- 11

NATURAL HAZARDS AND DISASTER MANGEMENT

(CREDITS: THEORY-4, PRACTICALS-2)

THEORY

LECTURES:

Unit 1: The Lithosphere and Related Hazards

- Atmospheric Hazards, Hydrosphere and Related Hazards.

Unit 2: Concepts of disaster:

- Types of disaster: nature and manmade: Cyclone, flood, land slide, land subsidence, fire and earthquake, tsunami, volcanoes.

Unit 3:

- Tectonics and Climate, Meteorite Impacts.
- Issues and concern for various causes of disasters
- Disaster management, mitigation, and preparedness
- Techniques of monitoring and design against the disasters
- Management issues related to disaster

Unit 4: Disaster Management in India

- Risk, Vulnerability and Hazard.
- Mitigation through capacity building
- Legislative responsibilities of disaster management
- Disaster mapping, assessment, Pre-disaster risk & vulnerability reduction
- Post disaster recovery & rehabilitation
- Disaster related infrastructure development

Unit 5: Hazard zonation Mapping

- Remote-sensing and GIS applications in real disaster monitoring. Prevention and rehabilitation.

The course will also include discussions on topics determined by students in Tutorial. There would be 12 student presentations apart from the lectures. The topics would be assigned to students based on their interest.

SUGGESTED READINGS:

1. Bell, F.G., 1999. Geological Hazards, Routledge, London.
2. Bryant, E, 1985. Natural Hazards, Cambridge University Press.
3. Smith, K., 1992 Environmental Hazards. Routledge, London.
4. Subramaniam, V., 2001. Textbook in Environmental Science, Narosa International

SEM - V

CORE COURSE: GEOLOGY

Paper – C- 12

FIELD GEOLOGY -I

(Basic Field Training)

(CREDITS: THEORY-4, PRACTICALS-2)

Unit 1:

- Orientation of Topographic sheet in field, marking location in toposheet
- Bearing (Front and back).
- Concepts of map reading, Distance, height and pace approximation

.

Unit 2:

- Identification of rock types in field.
- Structures and texture of rocks.
- Use of hand lens.

Unit 3:

- Basic field measurement techniques: Bedding, dip and strike.
- Basic concepts of Litholog measurement

Unit 4: Reading contours and topography

SEM - VI

CORE COURSE: GEOLOGY

Paper – C- 13

FIELD GEOLOGY –II

(Geological mapping)

(CREDITS: THEORY-4, PRACTICALS-2)

Unit 1:

- Geological mapping, stratigraphic correlation

.

Unit 2:

- Primary (scalars and vectors) and secondary structures (linear and planar)

Unit 3:

- Trend, plunge, Rake/Pitch.

Unit 4:

- Stereoplots of linear and planar structures,
- Orientation analyses

SEM - VI
CORE COURSE: GEOLOGY
Paper – C- 14
FIELD GEOLOGY –III
(Economic Geology field)
(CREDITS: THEORY-4, PRACTICALS-2)

Module I

Unit 1:
- Visit to any mineral deposit

Unit 2:
- Mode occurrence of, Ore mineralogy

Unit 3:
- Ore-Host rock interrelation

Unit 4:
- Ore formation process

Unit 5:
- Basic techniques of surveying concept of outcrop mapping

Module I

Unit 1:
- Visit to underground or open cast mine

Unit 2:
- Practical experience of mining methods

Unit 3:
- Underground mapping/ Bench mapping

Unit 4:
- Isopach and Isochore maps

Note: Necessary changes in the course of study may be proposed by Board of Studies at the time of its implementation.

SEMESTER - V
DSE-1
ESSENTIALS OF GEOLOGY
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

Unit 1:

- Introduction to Geology, scope, sub-disciplines and relationship with other branches of sciences

Unit 2:

- Earth in the solar system: origin
- Earth's size, shape, mass, density, rotational and evolutional parameters.
- Solar System-Introduction to Various planets-Terrestrial and Jovian Planets
- Internal constitution of the earth: core, mantle and crust

Unit 3:

- Convections in the earth's core and production of magnetic field
- Composition of earth in comparison to bodies in the solar system

Unit 4:

- Origin of hydrosphere and atmosphere-Their composition
- Origin of biosphere
- Origin of oceans, continents and mountains

Unit 5:

- Age of the earth: Radioactivity and its application in determining the age of the Earth.
- Basic concepts of Rocks, Minerals and Fossils

PRACTICAL:

- Plotting of Contour maps and identification and description of important topographical features.
- Study of Topographic Sheets: Tracing of contours and drainage network.
- Plotting of major Stratigraphic units on the outline map of India
- Plotting of major Dams on the outline map of India; mention name of the river and Utility of the dam.
- Study of Seismic Zones of India.

SUGGESTED READINGS:

1. Holme's Principles of Physical Geology. 1992. Chapman & Hall.
2. Emiliani, C, 1992. Planet Earth, Cosmology, Geology and the Evolution of Life and Environment. Cambridge University Press.
3. Gross, M.G., 1977. Oceanography: *A view of the Earth*, Prentice Hall

SEMESTER - V
DSE - 2
ROCKS AND MINERALS
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

Unit 1:

- Minerals-Definitions, Classification and Physical properties of minerals.

Unit 2: Mineral structures

- Mineralogy of the Earth's crust, mantle and core

Unit 3: Nature of light and principles of optical mineralogy

- Classification of minerals based on optical properties.
- Petrological Microscope
- Optical properties of minerals

Unit 4: Rocks- Definitions and types, Basics of rock formation.

- Igneous rock- magma generation and differentiation, texture and Structure
- Sedimentary rocks- surface processes and sedimentary environments, texture and Structure
- Metamorphic rocks- Agents and types of metamorphism. Texture and Struture
- Rock cycle-interactions between plate tectonic and climate systems

PRACTICAL:

- Study of physical properties of minerals
- Study of optical properties of minerals
- Study of rocks in hand specimen
- Study of rocks in thin section
- Observation and documentation of Crystal Symmetry

SUGGESTED READINGS:

1. Earth Materials- Introduction to Mineralogy and Petrology, Cornelis Klein and Anthony Philpotts, Cambridge University Press, 2013.
2. Understanding Earth (Sixth Edition), John Grotzinger and Thomas H. Jordan, 2010. W.H. Freeman and company, Ney York.

SEMESTER - VI
DSE - 3
FOSSILS AND THEIR APPLICATIONS
(CREDITS: THEORY-4, PRACTICALS-2)

THEORY
LECTURES:

Unit 1: Introduction to fossils

- Definition of fossil, fossilization processes, modes of fossil preservation, role of fossils in development of geological time scale and fossils sampling techniques.

Unit 2: Species concept

- Definition of species, species problem in paleontology, speciation, methods of description and naming of fossils, code of systematic nomenclature.

Unit 3: Introduction to various fossils groups

- Brief introduction of important fossils groups: invertebrate, vertebrate, microfossils, spore, pollens and plant fossils.
- Important age diagnostic fossiliferous horizons of India.

Unit 4: Application of fossils.

- Principles and methods of paleontology.
- Application of fossils in the study of paleontology, paleobiogeography and paleoclimate.

Unit 5: Societal importance of fossils

- Implication of larger benthic and micropaleontology in hydrocarbon exploration: identification of reservoirs and their correlation.
- Application of spore and pollens in correlation of coal seams
- Spore and pollens as indicator of thermal maturity of hydrocarbons reservoirs
- Fossils associated with mineral deposits
- Fossils as an indicator of pollution.

PRACTICAL:

- Study of fossils showing various modes of fossilization
- Distribution of age diagnostic fossils in India
- Study of morphological characters of important Invertebrate fossils.
- Drawing and labeling of important invertebrate fossils.

SUGGESTED READINGS:

1. Schoch, R.M. 1989. Stratigraphy, Principles and Methods. VanNostrand Reinhold.
2. Clarkson, E.N.K. 1998. Invertebrate Palaeontology and Enolution Geore Allen & Unwin
3. Prothero, D.R. 1998. Bringing fossils to life – An introduction to Palaeobiology, McGraw Hill.
4. Benton, M.J. 2005. Vertebrate palaeontology (3rd edition). Blackwell Scientific, Oxford.
5. Colbert's Evolution of the Vertebrates: A History of the Backboned Animals through Time, EdwinH. Colbert, Michael Morales, Eli C. Minkoff, john Wiley & Sons, 1991

SEMESTER - VI
DSE - 4

Unit 1:
Project Work – the topic of project work to every student will be assigned by the Head, Department of Geology & Shall be evaluated for marks as per regulation.