



Urgent

(Both by post and by e-mail)

No. 8565 / Acd.-I

Dated: 11-11-16

To

The Principals,

(All the Affiliated Colleges under Sambalpur University having
Three Year Degree Courses excluding Autonomous Colleges.)

Sub: Syllabus & Implementation of CBCS pattern Arts/Science/Commerce (Pass and
Hons.) from the Academic Session 2016-17.

Ref :- This office letter No 5314/ Acd.-I dated 21.7.16 and letter No. 5970/Acd.-I
dated 8.8.16.

Sir,

In continuation to the letters and the subject cited above, I am directed to intimate you that the Vice- Chanceller has been pleased to approve the syllabus for Courses / papers related to **Geology** for CBCS + 3 courses degree B.Sc. (Both Pass & Hons.) examinations under 6 (15) of O.U. Act -1989 giving it effect from the Academic Session, 2016-17. The detail Courses of Studies is enclosed herewith for your reference and necessary action.

This may kindly be noted that it is the final syllabus for Geology subject/ papers under CBCS pattern. It may be made available to teachers and students concerned. Further you are requested to ensure teaching of the courses in your colleges accordingly.

Any error and omission etc. may kindly be intimated to this office.

. Any queries on the matter may be made through e-mail: coesuniv@gmail.com.

Thanking you,

Yours faithfully,

A handwritten signature in black ink, appearing to be 'S. K. S. S.', written over a horizontal line.

Controller of Examinations

A handwritten signature in black ink, appearing to be 'S. K. S. S.', written below the printed name.

Encl: *As above*

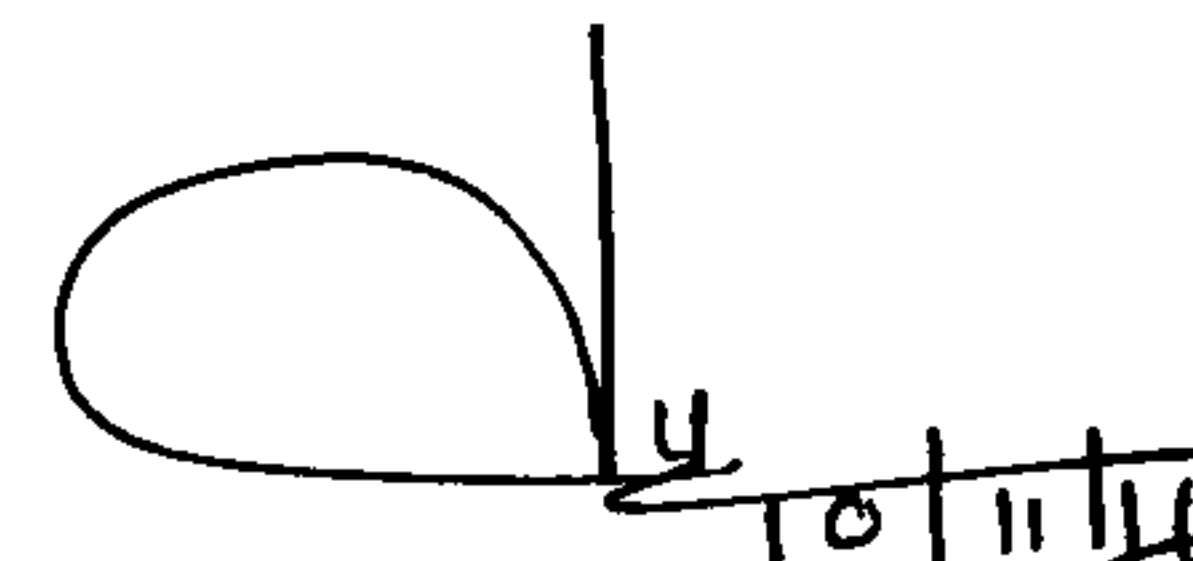
P.T.O.

Memo No. 8566 /Acad.-I(BOS),

dtd. 11-11-16

Copy forwarded with enclosure for information and necessary action to:

1. The Chairman, Post Graduate Council, Sambalpur University.
2. The H.O.D., P.G. Department of **Geology**, Sambalpur University.
3. The Director, College Development Council, Sambalpur University.
4. The Director, Directorate of Distance and Continuing Education, Sambalpur University.
5. The Co-ordinator, Private Examination Cell, Sambalpur University.
6. Asst. Registrar (Examination), Sambalpur University.
7. Programmer, University Computer Unit, Sambalpur University.
8. Asst. Controller of Examinations, Sambalpur University.
9. Section Officer / Assistant –in- Charge, **e – Governance Cell**, Sambalpur University with request to provide all the materials in the official web- site accordingly. (**as + 3 cbcs- syllabus Geology –Final**)
10. Section Officers, Computer Unit, E.G.-I, EG-II, E.C-I, EC-II, EC-VI Sections.
11. Five spare Copies for Academic-I Sections with enclosure.



Controller of Examinations
Block

Memo No. 8567 /Acad.-I(BOS),

dtd. 11-11-16

Copy forwarded without enclosure for information and necessary action to:

1. **The Dy. Director, e – Governance Cell**, Sambalpur University with request for needful to provide all the materials in the official web- site accordingly .
2. P.A. to the Vice- Chancellor, Sambalpur University.
3. P.A. to the Registrar, Sambalpur University.
4. P.A. to the Controller of Examinations, Sambalpur University.


Controller of Examinations
Block

HONOURS COURSE AT A GLANCE

SUBJECT- GEOLOGY

DISCIPLIN SPECIFIC CORE (14 PAPERS)

Number	Semester	Title of the Course	Credit	
			Theory	Practical
DSC-H-GEL-1	1 ST	Earth System Science	4	2
DSC-H-GEL-2		Mineral Science	4	2
DSC-H-GEL-3	2 nd	Element of Geochemistry	4	2
DSC-H-GEL-4		Structural Geology	4	2
DSC-H-GEL-5	3 rd	Igneous Petrology	4	2
DSC-H-GEL-6		Sedimentary Petrology	4	2
DSC-H-GEL-7		Palaeontology	4	2
DSC-H-GEL-8	4 th	Metamorphic Petrology	4	2
DSC-H-GEL-9		Stratigraphy	4	2
DSC-H-GEL-10		Hydrology	4	2
DSC-H-GEL-11	5 th	Economic Geology	4	2
DSC-H-GEL-12		Geomorphology	4	2
DSC-H-GEL-13	6 th	Engineering Geology	4	2
DSC-H-GEL-14		Remote Sensing	4	2

DISCIPLIN SPECIFIC ELECTIVE (4 PAPERS)

Number	Semester	Title of the Course	Credit	
			Theory	Practical
DSE-H-GEL-1	5 th	Exploration Geology	4	2
DSE-H-GEL-2		Meteorology	4	2
DSE-H-GEL-3	6 th	Fuel Geology	4	2
DSE-H-GEL-4		Environmental Geology and Disaster Management	4	2

GENERIC ELECTIVE (4 PAPERS)

Number	Semester	Title of the Course	Credit	
			Theory	Prac.
GE-H-GEL-1	1 st	General Geology, Crystallography and Mineralogy	4	2
GE -H-GEL-2	2 nd	Geomorphology, Tectonics, Stratigraphy & Palaeontology	4	2
GE -H-GEL-3	3 rd	Petrology, Geochemistry, Hydrology & Natural hazards	4	2
GE -H-GEL-4	4 th	Structural Geology, Engineering Geology & Economic Geology	4	2

SKIL ENHANCEMENT COURSES-LIST-A (Any one Paper)

Number	Semester	Title of the Course	Credit	
			Theory	
SEC-H-GEL-1	3 rd	Field Geology (Field study, Mapping & Report)	2	
SEC-H-GEL-2	3 rd	Information Technology	2	

D. Behary
3-9-16

S. Sonu
3-9-16

Jagadish Kumar
3-9-16

A. L. D.
3-9-16

FIRST SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-I, DSC-H-GEL-1 (EARTH SYSTEM SCIENCE)
(Credits: Theory-4, Practical-2)

UNIT-I	General Geology(A): Scope, Subdivisions of Geology, Solar system and its planets, the terrestrial and jovian planets, Origin of earth, Seismology and internal structure of earth, Age of the earth, Process of formation of soil, Soil profile and Indian types.
UNIT-II	General Geology(B): Volcanoes-Types, causes, products, volcanic topography and volcanic belts Earthquake- Terminology, Intensity, Magnitude, Causes, Effects, Seismic belts of India and Earth and Prediction of Earthquake
UNIT-III	Geotectonics(A): Concept of Plate Tectonics, Continental drift, Hotspot, Isostasy, Gravity Anomaly
UNIT-IV	Geotectonics(B): Geosynclines, Convergent Plate boundaries, Island arcs, Benioff zones, Subduction zones, Tectonic design and evolution of Himalayas.
UNIT-V	Geotectonics(C): Orogeny and Epiorogeny, Divergent Plate boundaries, Mid oceanic ridge, Sea floor spreading and Palaeo magnetism, Narmada rift valley, Tripple junction, Transform faults

Practical Paper-I

Drawing of tectonic elements, Seismic zones of Odisha and India, Drawing of seismic belts of world,
Drawing of soil profiles of Indian soils, Lab Record, Viva-voce

M. Behara
3.9.16

S. S. S.
3.9.16

Practical
3.9.16

63

FIRST SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-II DSC-H-GEL-2 (MINERAL SCIENCE)
(Credits: Theory-4, Practical-2)

UNIT-I	Crystallography: Crystalline and non-crystalline substance, Symmetry elements, forms, parameter and indices, Symmetry operation, H-M Symbols, 32 point groups, Classification of crystals into six systems, Study of six normal classes w.r.t. symmetry elements and forms present, Zonal equation, Twinning, Stereographic projection of crystals
UNIT-II	Mineralogy(A): Introduction and formation of minerals, Classification of minerals, Physical properties of minerals, Silicate structure, Isomorphism, Polymorphism, Pseudomorphism,
UNIT-III	Mineralogy(B): Study of structure, Chemistry, Physical and optical properties, occurrence of following mineral groups-Olivine, Garnet, Pyroxene, Amphibole, Feldspar, Quartz, Mica and Feldspathoid, Physical and optical properties of other rock forming minerals.
UNIT-IV	Optical Mineralogy(A): Nature of light rays and their propagation, Polarisation, Double refraction, Total internal reflection & Critical angle, Nicol prism: Construction, Principle & Use, Petrological microscope: Parts and Functions, Preparation of thin sections
UNIT-V	Optical Mineralogy(B): Isotropism, Anisotropism, Pleochroism, Refractive Index, Birefringence, Extinction, Interference Colour, Uniaxial Interference Figure, Determination of optic sign, An outline study of optical characters of minerals in thin sections

Practical Paper-II

Study and identification of crystal models, stereographic projection of crystal models, Megascopic and Microscopic identification of rock forming minerals, Lab Record, Viva-voce

D. Beheng
3-9-16

S. S. Son
3-9-16

D. J. Subudya
3-9-16

A. H. K.
3-9-16

SECOND SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-III, DSC-H-GEL-3, (ELEMENTS OF GEOCHEMISTRY)
(Credits: Theory-4, Practical-2)

UNIT-I	Geochemistry(A): Concepts of geochemistry, Periodic table, Geochemical classification of elements,
UNIT-II	Geochemistry(B): Cosmic abundance of elements, Composition of planets, Types and composition of meteorites
UNIT-III	Geochemistry(C): Structure and composition of earth, Distribution of major and trace elements in igneous, metamorphic and sedimentary rocks
UNIT-IV	Geochemistry(D): Concept of stable and radiogenic isotopes, Half life period, determination of age of earth by radioactive isotopes
UNIT-V	Geochemistry(D): Elements of marine chemistry, Diagenetic reactions

Practical Paper-III

Geochemical data plotting and interpretation of anomalies, Numerical problems related to age of the earth, Lab Record, Viva-voce

Meheng
3-9-16

S. S. S.
3-9-16

Rajendra Singh
3-9-16

(6)

SECOND SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-IV, DSC-H-GEL-4, (STRUCTURAL GEOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Structural Geology(A): Concept of stress and strain, Dip and Strike, Rake, Plunge V's rule, Outcrop patterns of different structures
UNIT-II	Structural Geology(B): Fold morphology: Geometric Classification of folds, Introduction to mechanics of folding, Criteria for recognition of folds, Salt domes, Effect of erosion on folded strata.
UNIT-III	Structural Geology(C): Joints: Geometry, classification and significance Fractures and Fault: Classification, Mechanism, Significance, Recognition in the field, Effects of faulting on outcrops, Top & bottom criteria
UNIT-IV	Structural Geology(D): Unconformity: Types, significance and recognition in the field, Top and bottom criteria Overlap, Offlap, Outlier, Inlier Petrofabric Analysis
UNIT-V	Structural Geology(E): Foliation: Description and origin, Axial plane cleavage & tectonic significance Lineation: Description and origin, relation with major structures

Practical Paper-IV

Drawing of geological section and interpretation, Completion of outcrops, Use of stereo net in solving structural problems and determination of thickness of beds, Three point problems, Rule of V, Lab Record, Viva-voce

D Behring
3.9.16

S. Son
3.9.16

Paper Submitted
3/9/16

Atkda
3.9.16

THIRD SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-V, DSC-H-GEL-5, (IGNEOUS PETROLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Igneous Petrology(A): Concept of Igneous Petrology and Magma, Forms, Textures and Structures of Igneous Rocks, Mode of Occurrence of Igneous Rocks
UNIT-II	Igneous Petrology(B): Bowen's Reaction Series, Differentiation and Assimilation, Classification of Igneous Rocks
UNIT-III	Igneous Petrology(C): Crystallisation behavior of Unicomponent magma, Bicomponent magma: Solid Solution, Eutectic and Peritectic Relation, Incongruent melting
UNIT-IV	Igneous Petrology(D): Ternary Systems, Tectonics and Magmatism
UNIT-V	Igneous Petrology(E): Description of igneous rocks: Basalt, Dolerite, Gabbro, Granite, Pegmatite, Syenite, Dunite, Diorite, Peridotite, Carbonatite, Anorthosite, Kimberlite, Komatiite, Lamproite

Practical Paper-V

Megascopic identification of igneous rocks, Microscopic identification of igneous rocks, Numerical problems, Field Report, Lab Record, Viva-voce

Abheera
3-9-16

Rajesh Kumar
3-9-16

16

THIRD SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-VI, DSC-H-GEL-6, (SEDIMENTARY PETROLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Sedimentary Petrology(A): Origin of sediments, Weathering and Sedimentary flux, Soils
UNIT-II	Sedimentary Petrology(B): Sedimentary Textures, Structures and Environment, Palaeocurrent Analysis
UNIT-III	Sedimentary Petrology(C): Classification of Sedimentary rocks, Diagenesis – Concepts and Stages, Compaction and Cementation
UNIT-IV	Sedimentary Petrology(D): Heavy minerals, their analysis and significance, Sedimentary basins of India.
UNIT-V	Sedimentary Petrology(E): Description of Sedimentary rocks – Sandstone, Conglomerate, Breccia, Shale. Limesone

Practical Paper-VI

Megascopic identification of Sedimentary rocks, Microscopic identification of Sedimentary rocks, Sedimentary grain size analysis and interpretation, Field Report, Lab Record, Viva-voce

Disheng
3-9-16

Paper B. Sankar
3/9/16

Alka
3-9-16

S. S. S.
3-9-16

THIRD SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-VII, DSC-H-GEL-7, (PALAEOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Palaeontology(A): Fossilisation and Fossil Record, Definition, Mode of Preservation and fossilization process, Significance of fossils, Biozones, Index fossils, Correlations
UNIT-II	Palaeontology(B): A brief idea on organic evolution, Evolution of man and horse, Foraminifera- Morphology, Distribution and Significance
UNIT-III	Palaeontology(C): Morphology, evolution and geological history of Brachiopoda, Pelecypoda, Gastropoda
UNIT-IV	Palaeontology(D): Morphology, evolution and geological history of Cephalopoda, Trilobita, Echinoidea, Corals and Graptolites
UNIT-V	Palaeontology(E): Introduction to Palaeobotany, Gondwana Flora, Application of fossils in stratigraphy,

Practical Paper-VII

Identification of Important Fossils, Drawing and labeling of fossils, Arrangement of fossils in chronological order, Field Report, Lab Record, Viva-voce

D. Behara
3.9.16

S. S. Soni
3.9.16
Practical Paper

CC

FOURTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-VIII, DSC-H-GEL-8, (METAMORPHIC PETROLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Metamorphic Petrology(A): Definition of metamorphism, Factors controlling metamorphism, Types of metamorphism, Impact of metamorphism
UNIT-II	Metamorphic Petrology(B): Textures and structures of metamorphic rocks, Classification, Metamorphic differentiation, Index minerals, zones, isograds
UNIT-III	Metamorphic Petrology(C): Concept of metamorphic facies, Mineralogical Phase Rule of closed and open systems, AKF and ACF diagrams
UNIT-IV	Metamorphic Petrology(D): Metamorphism and tectonism, Migmatites and their origin, Granitisation, Paired metamorphic belts
UNIT-V	Metamorphic Petrology(E): Description of metamorphic rocks – Schist, Gneiss, Khondalite, Charnockite, Eclogite, Blueschist, Marble, Quartzite, Phyllite, Slate, Skarn

Practical Paper-VIII

Megascopic identification of metamorphic rocks, Microscopic identification of metamorphic rocks, Numerical problems, Field Report, Lab Record, Viva-voce

D. Behary
3-9-16

S. S. Sonu
3-9-16

Rajesh Kumar Singh
3/9/16

A. K. Jha
3.9.16

FOURTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-IX, DSC-H-GEL-9, (STRATIGRAPHY)
(Credits: Theory-4, Practical-2)

UNIT-I	Stratigraphy(A): Introduction, Principle, Correlation, Code of stratigraphic nomenclature and classification, Stratigraphic time scale, Tectonic divisions of India
UNIT-II	Stratigraphy(B): Introduction to Indian Shield Archaean: Dharwar Supergroup, Singbhum-Orissa, Bundelkhand, Aravalli, Delhi Supergroup, Sausar Group, Easternghat Supergroup
UNIT-III	Stratigraphy(C): Cuddapah Supergroup, Vidhyan Supergroup, Gondwana Supergroup with special emphasis on fossils, climate and economic importance
UNIT-IV	Stratigraphy(D): Palaeozoics of Himalayas, Triassic of Spiti, Jurassic of Kutch, Cretaceous of Trichnipoly, Kutch basin, Siwalik Basin, Assam, Andaman and Arakan basin
UNIT-V	Stratigraphy(E): Volcanic Provinces: Deccan Trap, Rajmahal Trap, Sylhet Trap, Siwalik Group, Tertiary of Assam Stratigraphy of Odisha, Quarternary landforms and deposits of India.

Practical Paper-IX

Drawing of stratigraphic units in outline map of India and Odisha, Identification and integration of stratigraphic assemblages, Stratigraphic correlation, Tectonic divisions of India, Field Report, Lab Record, Viva-voce

D Behara
3.9.16

S. S. Son
3.9.16

R. Pradhan
3.9.16

19

FOURTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-X, DSC-H-GEL-10, (HYDROGEOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Hydrogeology(A): Introduction, Scope of hydrogeology, Hydrologic cycle, Properties of water bearing formations, porosity, permeability,
UNIT-II	Hydrogeology(B): Specific Yield, Specific Retention, Storage Coefficient, Aquifer types, Darcy's Law
UNIT-III	Hydrogeology(C): Groundwater exploration: Geological, Geophysical and Remote sensing Methods, Physical and Chemical properties of water,
UNIT-IV	Hydrogeology(D): Ground water provinces of India and Odisha, Sea water intrusion, Artificial recharge of ground water, Rainwater harvesting
UNIT-V	Hydrogeology(E): Quality of Ground water and its use in domestic, agriculture and industries, Ground water pollution, Groundwater management

Practical Paper-X

Simple numerical problems related to ground water, Groundwater maps, Problems related to ground water quality, Interpretation of occurrence of ground water from maps, Field Report, Lab Record, Viva-voce

D. Behera
3-9-16

S. Saha
3-9-16

Tapas Kumar Saha
3-9-16

A. H. J.
3-9-16

FIFTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-XI, DSC-H-GEL-11, (ECONOMIC GEOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Economic Geology(A): Ores & gangues, tenor, grade and IOdes ore genesis: Magmatic Concentration, Pegmatitic deposits, hydrothermal process, Metamorphic process of ore deposit
UNIT-II	Economic Geology(B): Oxidation & supergene enrichment, Residual & mechanical Concentration, sedimentation, paragenesis, wall rock alteration, zoning.
UNIT-III	Economic Geology(C): Classification of mineral deposits, metallogenic epochs and provinces, controls of ore localisation, geothermometry.
UNIT-IV	Economic Geology(D): Mineral resources: Mineralogy, mode of occurrence, distribution and uses of Fe-ore, Mn, Cr, Pb, Zn, Cu, Bauxite
UNIT-V	Economic Geology(E): Asbestos, limestone, diamond, Kyanite, Gold, graphite, magnesite Introduction to gemstones

Practical Paper-XI

Megascopic identification of economic minerals (metallic and nonmetallic), Location of Economic Mineral deposits on the outline map of India and Odisha, , Lab Record, Viva-voce

Dr. Beheng
3-9-16

S. S. Panigrahi

P. K. Panigrahi
3-9-16

(4)

FIFTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-XII, DSC-H-GEL-12, (GEOMORPHOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Geomorphology(A): Basic concepts of Geomorphology, Weathering and Erosion, Karst Topography, Rejuvenated Landforms, Drainage System and Pattern
UNIT-II	Geomorphology(B): Geological work of running water, wind and glacier
UNIT-III	Geomorphology(C): Coastal Geomorphology: Spit, Tombolo, Lagoon, Sandbar, Bays, Coves, Coral Reef.
UNIT-IV	Geomorphology(D): Relief of ocean floor, Marine sediments and their classification, Marine resources, Pollution Of marine environment, Man and ocean
UNIT-V	Geomorphology(E): Volcanic landforms, Plateau: general characteristics and classification, Geomorphic divisions of India,

Practical Paper-XII

Study of topographic maps and drawing of profile, Study of land forms and representation of land forms by contour diagrams, Interpretation of top sheets, Drainage basin analysis, Lab Record, Viva-voce.

AKK
3-9-16

D Behara
3-9-16

S. S. Sanyal
3-9-16

Deepankar Sanyal
3-9-16

SIXTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-XIII, DSC-H-GEL-13, (ENGINEERING GEOLOGY)
(Credits: Theory-4, Practical-2)

UNIT-I	Engineering Geology(A): Introduction, role of engineering geologists in planning, design & construction of major man made structural features.
UNIT-II	Engineering Geology(B): Site investigation, foundation treatment: grouting, rock bolting & other support mechanisms, Back filling, soil stabilization, building stones, alkali aggregate reaction.
UNIT-III	Engineering Geology(C): Properties of rocks & soils, Geological, geotechnical & environmental considerations for dams and reservoirs.
UNIT-IV	Engineering Geology(D): Tunñel- geological consideration and environmental impact.
UNIT-V	Engineering Geology(E): Geological consideration in bridge site, landslides- causes, factors & preventive measures.

Practical Paper-XIII

Engineering properties of building and road materials, Merits, demerits and remedial measures based upon geological cross section of project sites, Problems on porosity and permeability, Lab Record, Viva-voce

D. Behara
3-9-16

S. S. S.
3-9-16

T. K. S.
3-9-16

SIXTH SEMESTER
CORE COURSE: GEOLOGY
Theory Paper-XIV, DSC-H-GEL-14, (REMOTE SENSING)
(Credits: Theory-4, Practical-2)

UNIT-I	Remote sensing(A): Concept of aerial photography and remote sensing, Types of aerial photography, Indian R.S.Satellites and sensors, Sequence involved in Aerial Photography, Drift & Crab, Mosaic, Scale in Aerial Photography
UNIT-II	Remote sensing(B): Sensors, filters, stereoscopes, elements of aerial photo interpretation
UNIT-III	Remote sensing(C): Application of Photogeology and R.S in Ground water and Mineral exploration
UNIT-IV	Remote sensing(D): .Application of Photogeology and R.S in geomorphological and structural mapping.
UNIT-V	Remote sensing(E): Application of Photogeology and R.S in studies on soil and agriculture, forestry and environment

Practical Paper-XIV

Aerial Photo interpretation, Identification of rock types in Aerial Photos, Simple numerical problems related to Aerial Photos, Identification of landforms and drainage patterns in Aerial Photos, Lab Record, Viva-voce

Alhda
3.9.16

A. Beheng
3.9.16

S. S. S.
3.5.16

Tapu Bishu
3/9/16

DISCIPLINE SPECIFIC ELECTIVE
SEMESTER-V
PAPER-I (EXPLORATION GEOLOGY)
(Credits: Theory-4, Practical-2)

- Unit-I Resource reserve definition, A brief overview of classification of mineral deposit with respect to process of formation and in relation to exploration strategies.
- Unit-II Principles of mineral exploration, prospecting and exploration: Conceptualization, methodology and stages, sampling, sub-surface sampling including pitting, trenching and drilling, geological, geochemical and geophysical exploration.
- Unit-III Drilling & logging, core & non-core drilling, planning of bore holes & location of bore holes on ground, core logging.
- Unit-IV Reserve estimations & errors: Principles of reserve estimation, density & bulk density, factors affecting reliability of reserve estimation. reserve estimation based on geometrical methods (polygon, square, rectangular, triangular) & regular & irregular grid patterns, statistics & error estimation.
- Unit-V Mining terminology, Classification of mining methods, Open cast mining, Underground mining methods (Stopping methods-Board and pillar, Long wall, Cut and fill, Shrinkage stopping), chain and compass survey.

PRACTICAL

Problems related to exploration, Reserve estimation, Chain and Compass survey, Preparation of sub-surface lithologs.

Meheng
3-9-16

S. S. Son
3-9-16

Jagdish Kumar
3-9-16

DISCIPLINE SPECIFIC ELECTIVE
SEMESTER-V
PAPER-II (Meteorology)
(Credits: Theory-4, Practical-2)

- Unit-I Elements of Weather and Climate; Structure and chemical composition of the atmosphere,
- Unit-II Temperature and pressure belts of the world; Jet streams and its effect on weather,
- Unit-III Planetary and local winds; Cloud formation and precipitation processes, Types and distribution of precipitation,
- Unit-IV Air masses (Source Region, Classification, its affect on world weather), fronts (general characteristics, frontogenesis, classification,
- Unit-V Heat budget of the earth; Indian monsoon,

~~AKK~~
3-9-16

Meheng
3-9-16

S.Son
3-5-16

D. S. Son
3-7-16

DISCIPLINE SPECIFIC ELECTIVE
SEMESTER-VI
PAPER-III (FUEL GEOLOGY)
(Credits: Theory-4, Practical-2)

Unit-I	Coal: definition, origin, grade, classification of coal, fundamental of coal petrology: lithotype, microlithotypes & macerals in coal.
Unit-II	Coal as fuel: coal bed methane (CBM) global & Indian scenario underground coal gasification, coal liquefaction. Distribution of coal in India
Unit-III	Petroleum: chemical composition and physical properties of crudes in nature. Origin of petroleum, maturation of kerogen: Biogenic & thermal effect
Unit-IV	Petroleum reservoirs & traps Reservoir rocks, classification of reservoir rocks, hydrocarbon traps : Definition, anticlinal and trap theory. Classification of hydrocarbon traps- structural, stratigraphic & combination. Cap rocks – definition and properties.
Unit-V	Nuclear fuel, Distribution of petroleum in India.

PRACTICAL:

Plotting of coal, petroleum and radioactive mineral deposits in the map of India and Odisha, Study of hand specimens of coal, Reserve estimation of coal, Correlation of bore-logs of coal deposits.

D. Behara
3.9.16

S. S. Saha
3.9.16

Tapendu Kumar
3.9.16

57

DISCIPLINE SPECIFIC ELECTIVE

SEMESTER-VI

PAPER-IV (ENVIRONMENTAL GEOLOGY & DISASTER MANAGEMENT)

(Credits: Theory-4, Practical-2)

- UNIT - I Environmental Geology (A)
Spectrum of environmental geology, land-uses, Role of geologists in environmental planning and management.
- UNIT-II Environmental Geology (B)
Erosion: causes and control, desertification and degradation, impact of mining activities on environment, Environmental impact of river valley project.
- UNIT- III Environmental Geology (C)
Soil erosion and conservation, Soil pollution, impact of excess withdrawal of ground water.
- UNIT- IV Natural disaster (A)
Concept of disaster, types of disaster: natural and manmade- land slide, earthquake, tsunami & volcanic eruption.
- UNIT- V Natural disaster (B)
Disaster management, mitigation and preparedness, pre-disaster risk and vulnerability reduction, post disaster recovery & rehabilitation, disaster related infrastructure development.

PRACTICAL:

Seminar on any topic related to environment, Natural disaster and Geology.

~~All/da~~
3.9.16

D. Behara
3.9.16

S. S. Sonu
3.9.16

D. S. S. Sonu
3.9.16

FIRST SEMESTER
GEOLOGY HONS GENERIC ELECTIVE
Theory Paper-I (General Geology, Crystallography and Mineralogy)

UNIT-I	General Geology: Scope, importance and branches of geology , Age, Origin, and Internal structure of the Earth, Earthquake with its causes, scale, some examples
UNIT-II	Crystallography: Elementary idea about crystal morphology in relation to their internal structure, Crystal parameter and indices, Crystal symmetry and classification of crystal into six normal classes, along with their, axial relationship, symmetry elements, forms present and at least five examples
UNIT-III	Optical Mineralogy: Properties of light, petrological microscope, polarisation, double refraction, R.I, Nicol prism, pleochroism, Isotropism, extinction angle, Birefringence, Interference colour
UNIT-IV	Mineralogy: Siliçate structure, physical properties of minerals, Polymorphism, Isomorphism
UNIT-V	Mineral groups: Description of different mineral groups with reference to its mineralogy, chemistry, physical properties, optical properties and uses of Olivine, Pyroxene, Mica, Feldspar, Quartz, Amphibole and Garnet group

Practical Paper-I

Study of crystal models, Megascopic and Microscopic identification of minerals, Map (Geomorphology)

Lab Record, Viva-voce.

D. Behara
3.9.16

S. S. S.
3.5.16

Rajendra Singh
3.9.16

54

SECOND SEMESTER
GEOLOGY HONS GENERIC ELECTIVE
Theory Paper-II (Geomorphology, Tectonics, Stratigraphy & Palaeontology)

UNIT-I	Geomorphology: Weathering and erosion, Geological work of river and landforms developed because of erosion and deposition Geological work of wind and glacier and landforms developed because of erosion and deposition Volcano, its type, products
UNIT-II	Tectonics: Continental drift, Concept of plate tectonics, Isostasy, MOR, Island arc, Sea floor spreading
UNIT-III	Stratigraphy (A): Principles of stratigraphy, Stratigraphic correlation, General Stratigraphic timescale, stratigraphy of Cuddapah, Vindhyan, Gondwana and Dharwar along with its Stratigraphic succession, lithology, economic importance, structure and fossil content if any
UNIT-IV	Stratigraphy (B): Stratigraphy of Triassic of Spiti, Jurassic of Kutch, Siwalik and Tertiary of Assam
UNIT-V	Palaeontology: Mode of preservation of fossils, Morphology, geological distribution and evolution of Brachiopods, Cephalopods, Gastropoda, Trilobita, Pelecypoda

Practical Paper-II

Tectonic zones of india, Plotting of Stratigraphy units in India and Odisha map, Identification of fossils, Lab Record, Viva-voce

AHk
3-9-16

A Behera
3-9-16

S. Saha
3-9-16

Prashant
3-9-16

THIRD SEMESTER
GEOLOGY HONS GENERIC ELECTIVE
Theory Paper-III (Petrology, Geochemistry, Hydrology & Natural hazards)

UNIT-I	Igneous and Metamorphic Petrology: Forms, structure, texture and classification of igneous rocks, Bowen's reaction series Agents and type of metamorphism, structure, texture of metamorphic rocks
UNIT-II	Sedimentary Petrology: Process of formation of sedimentary rock, texture, structure and Classification of sedimentary rock, Individual classification of Sandstone and Limestone
UNIT-III	Geochemistry: Cosmic abundance elements, Rock cycle, Composition of Meteorites, Geo-chemical classification of elements
UNIT-IV	Ground Water/Hydrogeology: Vertical zonation of ground water, Types of Aquifer, Hydro geological properties of rock like Porosity, permeability, specific retention, specific yield
UNIT-V	Natural hazards: The causes, effects and mitigation measures for flood and cyclone, Landslide, Tsunamis and Marine transgression and regression

Practical Paper-III

Megascope identification of igneous, metamorphic and sedimentary rocks, Microscopic identification of igneous, metamorphic and sedimentary rocks, Study of ground water conditions in a given map, Lab Record, Viva-voce

M. Behara
3-9-16

S. S. Son
3-5-16

T. J. Singh
3-5-16

Fourth SEMESTER
GEOLOGY HONS GENERIC ELECTIVE
Theory Paper-IV (Structural Geology, Engineering Geology & Economic Geology)

UNIT-I	Structural Geology(A): Concept of dip and strike, Determination of top and bottom of beds, Definition and classification of folds.
UNIT-II	Structural Geology(B): Definition and classification of faults and its recognition in the field, Origin, types of unconformity and its recognition in the field. Definition and classification of joints
UNIT-III	Engineering Geology: Description, site selection and effect of Dam, Bridge, Tunnel Engineering properties of rock
UNIT-IV	Economic Geology (A): Process of formation of Ore deposits, Mode of occurrence, genesis, mineralogy, Indian distribution and uses of metallic ores of Iron, Manganese, Copper, Aluminium
UNIT-V	Economic Geology (B): Mode of occurrence, genesis, mineralogy, Indian distribution and uses of Nonmetallic ores Mica, Limestone, Gypsum, Asbestos, Mode of occurrence, genesis, Indian distribution and uses of Coal and Petroleum.

Practical Paper-IV

Structural map, Megascopic identification of ores, Ore reserve calculation, Field Report, Lab Record, Viva-voce

AKD
3.9.16

M Beheng
3.9.16

S/Son
3.9.16

Tapas Bahuguna
3.9.16

SKILL ENHANCEMENT COURSE

Project work

(2 credit)

1. Geological Mapping
2. Remotesensing and GIS
3. Ground Water Studies
4. Engineering Geology
5. Economic Geology
6. Fossil Studies
7. Environmental Geology
8. Applied Geology
9. Geological Resource Management
10. Natural Disaster Management

D. Beheng

3-9-16

S. S. 802

3-5-16

Jayanti Kulkarni

3-9-16

132

**PASS COURSE AT A GLANCE
SUBJECT- GEOLOGY**

DISCIPLIN SPECIFIC CORE 4 PAPERS

Number	Semester	Title of the Course	Credit	
			Theory	Practical
DSC-P-GEL-1	1 ST	General Geology and Mineralogy	4	2
DSC-P-GEL-2	2 nd	Geomorphology, Stratigraphy and Paleontology	4	2
DSC-P-GEL-3	3 rd	Petrology, Geochemistry, Ground water & Natural Hazard	4	2
DSC-P-GEL-4	4 th	Structural Geology, Engineering Geology, & Economic Geology	4	2

DISCIPLIN SPECIFIC ELECTIVE 2 PAPERS

Number	Semester	Title of the Course	Credit	
			Theory	Practical
DSE-P-GEL-1	5 th	Exploration Geology	4	2
DSE-P-GEL-2	6 th	Fuel Geology	4	2

SKIL ENHANCEMENT COURSES-LIST-A (Any one Paper)

Number	Semester	Title of the Course	Credit	
			Theory	
SEC-P-GEL-1	3 rd /4 th /5 th	Field Geology	2	
SEC-P-GEL-2	3 rd /4 th /5 th	Information Technology	2	

D Behary
3.9.16

S.S. Soni
3.9.16

Alhda
3.9.16

Tapan Kumar
3.9.16

**FIRST SEMESTER
GEOLOGY PASS PAPER-I**

Theory Paper-I (General Geology, Crystallography and Mineralogy)

UNIT-I	General Geology: Scope, importance and branches of geology , Age, Origin, and Internal structure of the Earth, Earthquake with its causes, scale, some examples
UNIT-II	Crystallography: Elementary idea about crystal morphology in relation to their internal structure, Crystal parameter and indices, Crystal symmetry and classification of crystal into six normal classes, along with their, axial relationship, symmetry elements, forms present and at least five examples
UNIT-III	Optical Mineralogy: Properties of light, petrological microscope, polarisation, double refraction, R.I, Nicol prism, pleochroism, Isotropism, extinction angle, Birefringence, Interference colour
UNIT-IV	Mineralogy: Silicate structure, physical properties of minerals, Polymorphism, Isomorphism
UNIT-V	Mineral groups: Description of different mineral groups with reference to its mineralogy, chemistry, physical properties, optical properties and uses of Olivine, Pyroxene, Mica, Feldspar, Quartz, Amphibole and Garnet group

Practical Paper-I

Study of crystal models, Megascopic and Microscopic identification of minerals, Map (Geomorphology)

• Lab Record, Viva-voce.

D. Behara
3-9-16

S. S. Saha
3-9-16

Pranab Kumar
3-9-16

5

SECOND SEMESTER
GEOLOGY PASS PAPER-2

Theory Paper-II (Geomorphology, Tectonics, Stratigraphy & Palaeontology)

UNIT-I	Geomorphology: Weathering and erosion, Geological work of river and landforms developed because of erosion and deposition Geological work of wind and glacier and landforms developed because of erosion and deposition Volcano, its type, products
UNIT-II	Tectonics: Continental drift, Concept of plate tectonics, Isostasy, MOR, Island arc, Sea floor spreading
UNIT-III	Stratigraphy (A): Principles of stratigraphy, Stratigraphic correlation, General Stratigraphic timescale, stratigraphy of Cuddapah, Vindhyan, Gondwana and Dharwar along with its Stratigraphic succession, lithology, economic importance, structure and fossil content if any
UNIT-IV	Stratigraphy (B): Stratigraphy of Triassic of Spiti, Jurassic of Kutch, Siwalik and Tertiary of Assam
UNIT-V	Palaeontology: Mode of preservation of fossils, Morphology, geological distribution and evolution of Brachiopods, Cephalopods, Gastropoda, Trilobita, Pelecypoda

Practical Paper-II

Tectonic zones of india, Plotting of Stratigraphy units in India and Odisha map, Identification of fossils, Lab Record, Viva-voce

AHk
3-9-16

P. Behara
3-9-16

S. S. Son
3-9-16

R. Prasad
3-9-16

**THIRD SEMESTER
GEOLOGY PASS PAPER-3**

Theory Paper-III (Petrology, Geochemistry, Hydrology & Natural hazards)

UNIT-I	Igneous and Metamorphic Petrology: Forms, structure, texture and classification of igneous rocks, Bowen's reaction series Agents and type of metamorphism, structure, texture of metamorphic rocks
UNIT-II	Sedimentary Petrology: Process of formation of sedimentary rock, texture, structure and Classification of sedimentary rock, Individual classification of Sandstone and Limestone
UNIT-III	Geochemistry: Cosmic abundance elements, Rock cycle, Composition of Meteorites, Geo-chemical classification of elements
UNIT-IV	Ground Water/Hydrogeology: Vertical zonation of ground water, Types of Aquifer, Hydro geological properties of rock like Porosity, permeability, specific retention, specific yield
UNIT-V	Natural hazards: The causes, effects and mitigation measures for flood and cyclone, Landslide, Tsunamis and Marine transgression and regression

Practical Paper-III

Megascopic identification of igneous, metamorphic and sedimentary rocks, Microscopic identification of igneous, metamorphic and sedimentary rocks, Study of ground water conditions in a given map, Lab Record, Viva-voce

D. Behara
3-9-16

S. S. Saha
3-9-16

P. S. Saha
3-9-16

**Fourth SEMESTER
GEOLOGY PASS PAPER-4**

Theory Paper-IV (Structural Geology, Engineering Geology & Economic Geology)

UNIT-I	Structural Geology(A): Concept of dip and strike, Determination of top and bottom of beds, Definition and classification of folds.
UNIT-II	Structural Geology(B): Definition and classification of faults and its recognition in the field, Origin, types of unconformity and its recognition in the field. Definition and classification of joints
UNIT-III	Engineering Geology: Description, site selection and effect of Dam, Bridge, Tunnel Engineering properties of rock
UNIT-IV	Economic Geology (A): Process of formation of Ore deposits, Mode of occurrence, genesis, mineralogy, Indian distribution and uses of metallic ores of Iron, Manganese, Copper, Aluminium
UNIT-V	Economic Geology (B): Mode of occurrence, genesis, mineralogy, Indian distribution and uses of Nonmetallic ores Mica, Limestone, Gypsum, Asbestos, Mode of occurrence, genesis, Indian distribution and uses of Coal and Petroleum.

Practical Paper-IV

Structural map, Megascopic identification of ores, Ore reserve calculation, Field Report, Lab Record, Viva-voce

Alhda
3.9.16

D Beheng
3.9.16

S. G. Som
3.9.16

Tajinder Singh
3.9.16

DISCIPLINE SPECIFIC ELECTIVE (Pass)

(SEMESTER-V)

PAPER-I (EXPLORATION GEOLOGY)

(Credits: Theory-4, Practical-2)

- Unit-I Resource reserve definition, A brief overview of classification of mineral deposit with respect to process of formation and in relation to exploration strategies.
- Unit-II Principles of mineral exploration, geological, geochemical and geophysical exploration.
- Unit-III Drilling & logging, core & non-core drilling, planning of bore holes & location of bore holes on ground, core logging.
- Unit-IV Reserve estimations & errors: Principles of reserve estimation, density & bulk density, factors affecting reliability of reserve estimation. reserve estimation based on geometrical methods (polygon, square, rectangular, triangular).
- Unit-V Mining terminology, Classification of mining methods, Open cast mining, Underground mining methods (Stopping methods-Board and pillar, Long wall, Cut and fill, Shrinkage stopping), chain and compass survey.

PRACTICAL

Problems related to exploration, Reserve estimation, Chain and Compass survey, Preparation of sub-surface lithologs.

D. Behara
3-9-16

S. S. Soni
3-9-16

Rajendra Kumar
3-9-16

DISCIPLINE SPECIFIC ELECTIVE (Pass)

(SEMESTER-VI)

PAPER-II (FUEL GEOLOGY)

(Credits: Theory-4, Practical-2)

- Unit-I Coal: definition, origin, classification of coal, fundamental of coal petrology: lithotype, microlithotypes & maserals in coal proximate & ultimate analysis.
- Unit-II Coal as fuel: coal bed methane (CBM) global & Indian scenario underground coal gasification, coal liquefaction. Distribution of coal in India.
- Unit-III Petroleum: chemical composition and physical properties of crudes in nature. Origin of petroleum, Distribution of petroleum in India.
- Unit-IV Petroleum reservoirs & traps
Reservoir rocks, classification of reservoir rocks, hydrocarbon traps (defn, anticlinal theory) classification of hydrocarbon traps- structural, stratigraphic & combination. Cap rocks – definition and properties.
- Unit-V Other fuels – Gas hydrate, Nuclear fuel.

PRACTICAL:

Plotting of coal, petroleum and radioactive mineral deposits in the map of India and Odisha, Study of hand specimens of coal, Reserve estimation of coal, Correlation of bore-logs of coal deposits.

AKK
3-9-16

D Behery
3-9-16

S Som
3-5-16

Dr. Pradeep Kumar
3-9-16

SKILL ENHANCEMENT COURSE

Project work

(2 credit)

1. Geological Mapping
2. Remotesensing and GIS
3. Ground Water Studies
4. Engineering Geology
5. Economic Geology
6. Fossil Studies
7. Environmental Geology
8. Applied Geology
9. Geological Resource Management
10. Natural Disaster Management

Dbheng
3-9-16

SSon
3-9-16

Dapal Singh
3-9-16