

बिलासपुर विश्वविद्यालय
बिलासपुर (छत्तीसगढ़)



पाठ्यक्रम
पं. रज. व. (अंतिम)
मुगमकारन

परीक्षा : 2014

:: प्रकाशक ::

कुलसचिव बिलासपुर विश्वविद्यालय
बिलासपुर (छत्तीसगढ़)

obtain for a pass atleast 20% in each theory and Practical and 36% of the aggregate marks in the Theory and Practical separately in each examination. The above provision of 20% in each paper shall be applicable for Final Examination from the academic session of 1987-88.

8. No division will be assigned on the result of the Previous Examination the division in which a candidate is placed shall be determined on the basis of aggregate of marks obtained in both the M.Sc. Previous and M.Sc. Final Examination.

9. Successful candidates who obtain 60% or more of the aggregate marks shall be placed in the first Division, those obtaining less than 60% but not less 48% in the second Division and all other successful candidate obtaining less than 48% in the Third Division.

10. Candidates who gave passed the M.Sc. Examination of the University in any subject in Third or Second Division and desire to appear at the M.Sc. Examination in the same subject for improving division without attending a regular course of study in a College affiliated to the University or in a Teaching Department of the University be allowed to appear at the aforesaid examination as a non-collegiate student on the following conditions.

(i) There shall be only two Division for such candidates the First division and second Division. The Marks required for obtaining these division shall be the same as prescribed in the ordinance i.e. examinees who are successful in Final of the Examination and have obtained 50% or more aggregate of the marks in Previous and Final Examination taken together shall be placed in the First Division and Examinees who are successful in Final Examination and have obtained less than 60% but not less than 48% of aggregate marks in previous and Final examination taken together shall be placed in the Second Division.

(ii) The result of the candidates obtaining less than 48% of the aggregate marks in previous and Final Examination taken together shall not be declared.

(iii) Candidates shall have the option to appear at both the previous and final examination in one and the same year and for being successful at the examination, the candidates shall obtain 48% of the aggregate marks.

Provided that such candidates who opt to appear in previous and final examination separately shall have to obtain minimum aggregate required for the previous examination but he will have to obtain atleast 48% in the aggregate of previous and final examination taken together or else his result will be cancelled.

(iv) The syllabus for the examination shall be same as prescribed for the year in which the examination is held.

(v) Not more than two attempts shall be allowed to such a candidate. Failure of non-appearance at the examination after per permission has been accorded by the University shall be counted as an attempt. Provided however such candidates who to appear at the previous and final examination separately will be allowed only one attempt of the previous examination and two attempts as the final examination.

(vi) Candidates who wish to avail the opportunity given in foregoing paraes will have to apply for permission as required in the Ordinance relating to admission of non-collegiate students to the University examination along with registration fee.

(vii) In case, a student improves his division under provision of this para, the fresh Degree will be issued after concealing his first Degree.

M.Sc - Final Session 2007-08 Geology

General- There will be four theory papers and four practical in the examination of M.Sc. Final.

Fourth paper will be elective paper Choice to elect the paper for study can be made with the consultation of Head of the Department of college.

Dissertation work in substitution of elective paper will be allotted to those students who have secured atleast 60% marks in previous examination.

Theory Examination - Each theory paper shall be of three hours duration Students shall have to solve five question in each theory paper of which one shall be objective type covering the entire course of corresponding paper.

Each paper will be divided into five units. Two question shall be Set from each unit and they shall be marked 'Either' and 'or' Thus the student shall have to answer one question from each unit and shall have a choice within the unit only.

Practical Examination - Each practical Examination shall be of three to five hours duration. 20% marks shall be devoted to sessional works done during academic year, 10% marks shall devoted to viva - voce.

Field work - field work is integral part of geological studies. There would be atleast 3 week duration of field work. On completion of field work Student shall have to submit a comprehensive field report. Viva voce would be based on field report.

Dissertation - In substitution of elective paper- dissertation work can be allotted to qualified student. Subject and topics of dissertation would be provided by head of the department of institution depending upon basic facilities available to complete the allotted work.

Evaluation, marking, viva - voce on dissertation will be in accordance with University - Ordinances and U.G.C. Rules.

[Handwritten signatures and marks]

M.Sc. Final - Geology THEORY

Paper-	Title and allotted Units	M.M.
(i)	Environmental and Hydrogeology (2-5 Unit Each)	100
(ii)	Geophysical Exploration, Engineering Geology and Mining-Geology (3 Units, 2 Units)	100
(iii)	Fuel-Geology, (Coal, Petroleum and, & ore Geology atomic minerals) (3 Units , 1 Units, 1 Units)	100
(iv)	Elective papers./ dissertation work. Any one of the following	100
	(a) Advance Remote sensing in Geology- (5 Units)	
	(b) sedimentary Environment and sedimentary basin (5 Units)	
	(c) vertebrate Paleontology, & Palaeobotany (2-5 units each)	
Theory		Total- 400

PRACTICAL

Group	Title	M.M.
(1)	Environmental and Hydrogeology	50
(2)	Geophysical Exploration, and Engineering Geology	50
(3)	Fuel-Geology, Ore Geology	50
(4)	Elective papers./ Dissertation	50
		Total- 200

Theory - 400

Practical - 200

Grand Total - 600

Paper - I

Environmental and Hydrogeology

M.M. 100

Unit-1

1. Time scale of global changes in the ecosystem and climates.
2. Impact of circulation in atmosphere and oceans on climate, rainfall and agriculture.
3. Carbon di-oxide in atmosphere, Global Warming caused by Co2 increase in present atmosphere due to indiscrete exploitation of

fossil fuels, volcanic eruption and afforestation.

4. Cenozoic climate extremes, and its impact on human evolution.

Unit- 2

1. Records of palaeo temperatures in ice cores of glaciers.
2. Impact assessment of degradation, contamination of surface water and ground water due to;
 - (a) Industrialization.
 - (b) Urbanization.
3. Water logging problems due to indiscrete construction of :
 - (a) Canals,
 - (b) Reservoir.
 - (c) Dams,
4. Soil profiles, soil quality degradation due to irrigation, use of fertilizers and pesticides.

Unit- 3

1. Influence of neo-tectonics in seismic, hazard assessment.
2. Preparation of seismic hazard maps, distribution, magnitude and intensity of Earth quacks.
3. Ground water: Origin, types, Importance, Occurrence, movements, Renewable and non renewable ground-water resource.
4. Hydrologic properties of rocks; Porosity, Permeability, Specific yield, Specific - retention, Hydraulic conductivity, Transmissibility, storage - coefficient.

Unit- 4

1. Hydrographs, water table contour maps, hydrostratigraphic Units,
2. Ground-water quality; estimation and methods of treatments for various uses, ground-quality map of India, water contaminants and pollutants: problems of arsenic and fluoride.
3. Well hydraulics: confined, unconfined, steady, unsteady and radial flow, level fluctuations: causative factors and their measurements.
4. Methods of pumping test and analysis of test data, evaluation of aquifer parameters.

Unit-5

1. Artificial recharge of ground water, problems of over-exploitation, ground water - legislation.
2. Water - well technology: well types, drilling method, construction, design, development and maintenance of wells.
3. Water managements in rural and urban areas, salt water invasion in coastal aquifers, remedial measures.
4. Surface and subsurface geophysical and geological method of ground water exploration. Hydrogeomorphology mapping using various remote sensing techniques, Radio isotopes in hydrogeological studies.

Book - recommended for Environmental Geology :

- | | | |
|----------------------------|---|---|
| (i) Valdiya, K.S. 1987 | : | Environmental Geology-Indian-Context. Tata Mc Graw Hills. |
| (ii) Kellor, E.A. 1978 | : | Environmental Geology-Bell & Howell. U.S.A. |
| (iii) Bryant, E. 1985 | : | Natural Hazards-cambridge-University-Press |
| (iv) Patwardhan, A.M. 1999 | : | The Dynamic Earth system - prentice Hall. |
| (v) Subraminiam V. 2001 | : | Text book in Environmental science Naross-Internationl. |
| (vi) Bell, F.G. 1999 | : | Geological Hazards. Routledge London. |
| (vii) Smith, K. 1992 | : | Environmental Hazards, Rouldege London. |

Book recommended for hydrology -

- | | | | |
|--------|-------------------------------------|---|--|
| (i) | Todd, D.K. 1980 | : | Ground water hydrology, Jhon Willey. |
| (ii) | Davis, S.N. & De Wiest, R.J.M. 1966 | : | Hydrology - Jhon willey. |
| (iii) | Freeze, R.A. & Cherry, J.A. 1979 | : | Ground water, Pentice Hall. |
| (iv) | Fetter, C.W. 1990 | : | Applied Hydrogeology, Merill publishing. |
| (v) | Raghunath, N.M. 1982 | : | Ground water willey - eastren. |
| (vi) | Karanth, K.R. 1987 | : | Ground water, Assessment, Development and management, Tata Mc Graw Hill. |
| (vii) | Alley, W.M. 1993 | : | Regional ground - water quality, U.N.R. Newyork. |
| (viii) | Subramaniam, V. 2000 | : | water, Kingston Publ. London. |

A-1550 Paper II
Geophysical - Exploration, Engineering Geology and Mining Geology

M.M. 100

Unit-1

1. Variation of Gravity over the surface of the earth. Principle of gravimetre, Gravity field surveys, various types of corrections applied to the gravity data preparation for gravity anomaly maps and their interpretation in terms of shape, size and depth.
2. Geomagnetic field of earth, Magnetic properties of rock. Working principles of magnetometers. Field surveys and data- collection. Preparation of magnetic Anomaly maps and their quantitative interpretations. magnetic Anomaly anomaly due to single pole and dipole.
3. Introduction to aeromagnetic survey. Three dimensional currents flow, potential due to a point current source.
4. Resistivity method : basic principles, various types of Electrode configurations, field procedures. profiling and sounding.

Unit-2

1. Application of electrical methods in ground water prospecting and civil engineering problems.
2. Seismic method : Fundamental principle of wave propagation. refraction, reflection, survey for single interface. horizontal and dipping case.
3. Concept of seismic channel and multichannel recording of seismic data. End on and Split spread shooting techniques. C.P.D. method of data acquisition, shooting, gathering, stacking and record Section. seismic velocity and interpretation of seismic data.
4. Application in mineral and petroleum exploration. Description of bore hole environment. Brief outline of various well logging techniques. principles of electrical well logging and its application in petroleum ground water and mineral exploration.

Unit-3

1. Role of engineering geology in civil construction and mining industries. Various stages of engineering geological investigation for civil Engineering.
2. Engineering properties of rocks. physical characters of building stones. metal and concrete aggregates.

3. Geological consideration for evaluation of dams and reservoir sites. Dam foundation, rock - problems.
4. Geotechnical evaluation of tunnel alignments and transportation routes. Methods of tunneling. Purposes; various types of support.

Unit-4

1. Mass movement with special emphasis on land slides and cause of hill - slope instability.
2. Earth quakes and seismicity. Seismic Zone of India. Seismic design of buildings.
3. Influence of Geological condition on foundation and design of buildings.
4. Case histories of engineering projects and geological causes for mishaps and failure of Engineering structures.

Unit-5

1. Application of rock mechanics in mine planning, exploration and exploratory mining of surface deposits.
2. Exploration; underground mineral deposits involving, diamond drilling, shaft sinking, cross-cutting, winzings, stopping drifting.
3. Exploration of underground mineral deposits involving, room and pillaring, top slicing, sub Level caving and block cavings.
4. Exploration for placer deposit, open pit mining, ocean bottom mining. Mining hazards: mine inundation, Fire and rock burst.

Books - Recommended

- (i) Sharma, P.V. 1986 : Geophysical method in Geology. Elsevier.
- (ii) Sharma, P.V. 1997 : Environmental and Engineering Geophysics. Cambridge University press.
- (iii) Vogelsong, d. 1995 : Environmental Geophysical Mc Graw Hill prospecting.
- (iv) Dobrin, M.B. 1976 : Introduction to Geophysical Mc Graw Hill Prospecting.
- (v) Parasnis. D.S. 1975 : Principles of applied Geophysics, Chapman & Hall.
- (vi) Stanislaw, M. 1984 : Introduction to Applied Geophysics, Ridelpudl.
- (vii) Krynin, D.H. & Judd, W.r. Principles of Engineering geology CBS publ.

- (viii) McKinsty, H.E. 1962 : Mining Geology II Ed. Asia, Publ House.
- (ix) Clark, C.B. 1967 : Elementary mining III Ed. John Wiley.
- (x) Argyaswami, R.P.N. 1996 : course in mining Geology IV Ed. Oxford U.S.A.

Paper III

Fuel Geology Ore - Geology

M.M/ 100

Unit-1

1. Definition and origin of kerogen and coal Rank, grade and types of coal. Indian international classification : chemical characterization : proximate and ultimate analysis.
2. Coal Petrology. coal gasification and coal hydrogenation. Application of coal petrology in hydrocarbon exploration.
3. Coalbed methane : a new energy resource : maturation of Coal and generation of methane in coalbeds. Coal as reservoir. Fundamentals of coalbed methane exploration and production.
4. Geological, Geographical distribution of coal deposition in India. Methods of coal prospecting and estimation of coal reserves. Coal production and problems of coal industries in India

Unit-2

1. Composition and different fractions of petroleum. Origin. Nature and Migration of oil and gas. Transformation of organic matter into kerogen. Thermal cracking of kerogen.
2. Characteristics of reservoir rocks and traps (structural, stratigraphic, and combination) prospecting for oil and gas, drilling and logging procedures.
3. Oil bearing basins of India and world. Geology of the productive oil field of India. Position of oil and natural gas in India. Future prospect and economic scenario.
4. Mode of occurrence and associations of atomic minerals in nature. Atomic minerals as source of energy. Methods of prospecting and production in India.

Unit-3

1. Nuclear power stations of the country and future prospects. Atomic fuels and environments.

2. Modern concept of orogenesis ore deposits and plate tectonics.
3. Mode of occurrence of ore bodies - morphology and relationship to host rocks. Texture paragenesis and zoning of Ore and their significance.
4. Concept of ore-bearing fluids, their origin and migration; wall rock alteration structural, physico-chemical and stratigraphic control of ore localisation.

Unit - 4

1. Chemical composition of ores bulk chemistry, trace Elements, R.E.E. and isotopes (stable and radiogenic) Organic matter in ores and their significance.
2. Fluid inclusions in ores : principles, limitations and applications.
3. Petrological ore associations with Indian examples:
 - (a) Orthomagmatic ores of mafic ultramafic associations diamonds in kimberlite.
 - (b) Rare earth elements (REE) in carbonatites: in V. ores.
 - (c) Chromite and Platinum, Gold - Ni ores Cu & Zn ores.
- (4) Ores of metamorphic affiliations - metamorphism of ores, metamorphogenic ores.

Unit - 5

1. Ores of sedimentary affiliation - chemical and clastic sedimentation. stratiform and stratabound ore deposits (Mn, Fe, Non ferrous ores).
2. Placers and palaeoplacers. Residual deposits of laterite bauxite.
3. Contemporary ore forming systems, eg. black smokers mineralised crust, Mn nodules.
4. Mineralogy genesis, use and Indian distribution of ore minerals to : Fe, Mn, Cr, Al, Au, Sn, ...

Books Recommended

- (1) Chandra D. Singh, R.M. and Singh, M.P. 2000 : Textbook of coal (India - Context)
- (2) Singh, M.P. 1998 : Coal and organic petrology, Hindustan publishers crop New - Delhi.
- (3) Stach, E. Mackowsky, M.T.H. Taylor G.H. Chandra, D. et al : 1982: Stach's Textbook of coal petrology. Gebruder Borntraeger, Stuttgart (W. Germany)
- (4) Lofson, G.D. and Tirasloo, E.N. 1980 : Introduction to petroleum

Geology. Gulf publ. Houston. TXas.

- (5) Tissot, B.P. and Wilke, D.H. 1984 : Petroleum formation and occurrence. Springer Verlag.
- (6) Selley, R.C. 1998 : Elements of petroleum geology : Academic press.
- (7) Durrance, F.M. 1986 : Radioactivity in geology principles and Applications Ellis Horwood.
- (8) Dahlkamp, L.J. 1998 : Uranium ore Deposits - Springer Verlag.
- (9) Boyle, R.W. 1982 : Geochemical prospecting for Thorium and Uranium deposits Elsevier.
- (10) Taylor, G.H. Teichmüller, M. Davis, N. Robert, P. et al: 1998 Organic petrology. Elsevier.
- (11) Sawkins, F.J. 1984 : Metal deposits in relation to plate tectonics. Elsevier.
- (12) Stanlon, R.L. 1972 : Ore petrology McGraw Hill.
- (13) Mookherjee, A. 200 : Ore genesis a holistic approach in India publ.
- (14) Torling, D.H. 1981 : Economic geology and Geology and Geolectonics. Blackwell publ.

PAPER - IV

Elective paper or Dissertation

M. M. 100

(Any one of the following)

- (a) Advance Remote sensing in Geology.
- (b) Sedimentary environment and Sedimentary Basins.
- (c) Vertebrate Palaeontology and Palaeobotany

ADVANCE REMOTE SENSING IN GEOLOGY

Unit-1

1. Types and geometry of aerial photographs. tilt and relief distortion.

2. Elements of photogrammetry, Stereoscopy, Stereovision flight planning Height and slope rectification of aerial photographs.

3. Aerial photo interpretation techniques. Recognition of photoelements and terrain elements like tone texture pattern shape, size.

4. Recognition of terrain elements like drainage, pattern, density type landform characteristics, Erosion behaviour of rock and soil material, Vegetation characteristics land use and associations.

Unit-2

1. Electromagnetic energy, electromagnetic spectrum, image characteristics.
2. Physics of remote sensing, black body radiation, law of radiation, atmospheric interaction, Scattering, reflection, absorption, transmission.
3. Remote sensing data products, geometric and radiometric, corrections, thermal and microwave sensing. Signature of the natural objects.
4. Indian Remote sensing satellites. Remote sensing techniques in Geosciences : Visual interpretation of satellite images, Techniques of image interpretation using spectral, spectral and temporal information.

Unit-3

1. Interpretation of Lithology : rock type discrimination of ^{different} climatic conditions.
2. Photo interpretation of structural and land form elements.
3. Photo interpretation of tectonic features, features of glaciers.
4. Photo interpretation of coastal, eolian and denudation land-form. Geomorphic mapping and terrain evolution.

Unit-4

1. Terrain analysis for engineering projects : principles, terrain classification, terrain mapping.
2. Application of remote sensing techniques in site selection of dams, bridges, air strips, roads tunnels, canals.
3. Studies in slope failure. rock failure and soil creep.
4. study of soils and relationship of rock types and geomorphology to various soil types.

Unit-5

1. Soil - mapping and land use and land cover mapping.
2. Forest types; their distribution and relationship of vegetation to rock types. relationship between Vegetation and geomorphologic parameters.
3. Geographic-Information-System : Components, data presentation, Vector and raster methods, input and output devices, soft ware and definition of equipments.
4. Database design and structure. Data analysis and cartographic modeling. Digital elevation model. Data representation and techniques of data integration.

Books - Recommended :-

- (1) Drury, D.N. 1987 : Image interpretation in geology. Allensunwin.
- (2) Lilesand, T.M. and Kiefor, R.W. 1987 :- Remote sensing and image Interpretation - Jhon Wiley.
- (3) Siegal, B.S. and Gillespie, A.R. 1980 :- Remote sensing in geology - John Wiley.
- (4) Ray, R.G. 1969 :- Aerial photographs in geological interpretations USGS. prof. paper 373.
- (5) Miller, V.C. 1961 :- Photogeology Mcraw Hill.
- (6) Panday, S.N. 1987 :- Principles and application of photogeology Wiley Eastern N. Delhi.
- (7) Gupta, R.P. 1990 :- Remote sensing geology - Springer veraly.
- (8) Paine, D.P. 1981 :- Aerial photographs and image interpretation of resource management. Jhon Wiley.
- (9) Moffitt, F.H. and mikharil, E.m. 1980 :- Photogrammetry. Hoper & Row.

SEDIMENTARY ENVIRONMENT & SED. BASINS.

Unit-1

1. Modern Laboratory techniques ; in Sedimentological studies.
2. Detailed study of Volcanoclastics, & Precipitates.
3. Clay deposits : Mineralogy, Physical properties, Chemistry & Genesis.
4. Processes of dolomitization & Phosphatization,

UNIT-2

1. Origin or various types of cements.
2. Use of trace fossils, Stromatolites, thrombolites and related structures in palaeoenvironmental analysis.
3. Methods of structures in palaeoenvironmental analysis.
4. Tectonics and Evolution of Sedimentary basins.

Unit-3

1. Sedimentary cycles, Rhythms and Cyclothems.
2. Analysis of sedimentary facies and preparation of facies maps.
3. Study of following sedimentary environments with emphasis on Lithofacies, biofacies, dynamics & desert, Alluvial Fluvial.
4. Study of following Sedimentary environments with emphasis on

Lithofacies, biofacies, dynamics & Glaciated, deltaic, Estuary environment.

Unit - 4

1. Study of sedimentary Environment with emphasis on Lithofacies, biofacies, dynamics & Clastic shore line, Clastic shelf.
2. Study of sedimentary environment with emphasis on Lithofacies, Biofacies, dynamics of; Marine evaporite basins, carbonate platform.
3. Study of Sedimentary environment with emphasis on Lithofacies biofacies, dynamics of; Deep sea & oca bottom, deep seatrench & rise.
4. Sedimentation pattern & depositional environment of Precambrian undeformed Sedimentary basins of India.

Unit - 5

1. Sedimentation pattern & depositional environment of palaeozoic Sedimentary basin of India.
2. Sedimentation Pattern and depositional environment of mesozoic sedimentary basin of India.
3. Sedimentary Pattern and depositional environment of tertiary sedimentary basin of India.
4. Sedimentary pattern and depositional environment of Quaternary and recent basin of India.

Books Recommended

1. Reading J.P. 1986 :Sedimentary environment and facies- Blackwell.
2. Reineck, H.E. & Sing, I.B. 1975: Depositional Sedimentary Environment - Springer - Verlag.
3. Carver, R.E. 1971 procedures in sedimentary petrology - Wiley interscience. John - Wiley.
4. Tucker, M. 1988. Techniques in sedimentary Blackwell.
5. Friedman, G.M. and Sanders, J.E. 1987: Principles of sedimentology John Wiley.
6. Guy, P.L. 1995: Sedimentary facies analysis spl. publ. IAS No.22 Blackwell.
7. Miall, A.D. 1996: The Geology of Fluvial deposits: Springer Verlag.
8. Miall, A.D. 1997: The Geology of Stratigraphic sequences Springer Verlag.

(C) Vertebrate Palaeontology and Palaeobotany Vertebrate :

Unit-1.

1. Characteristics of vertebrates, vertebrate skeleton, teeth and their modifications.
2. Nature of vertebrate fossil records methods of collection and preparation of vertebrate fossil records.
3. Classificatory characters and divisions of vertebrates: Agnathans, fishes, amphibians.
4. Classificatory Characters and divisions of vertebrates; Reptilia Aves and mammals.

Unit-2.

1. Origin of vertebrates.
2. Vertebrate life through ages and landmarks in their evolution.
3. General accounts of Gondwana vertebrates and Siwalik mammals and causes of their extinction.
4. Dinosaur and their extinction.

Unit-3.

1. Evolutionary trends in Equidae, proboscidae.
2. Evolution of man.
3. Evolutionary trends in hominidae. Tool culture.
4. Study of important genera of fossil vertebrates with particular reference to their distribution in the Indian subcontinent.

Palaeobotany:

Unit-4.

1. Origin and distribution of plant life, Dispersal and Migration of plants. Floral provinces. Plant life through ages.
2. Study of important world flora with special reference to pre-Gondwana Gondwana intertropical and tertiary flora of India.
3. Methods of preservation of plant fossils. A brief morphological study of different plant fossils.
4. Nature of the palaeobotanical records. Modern techniques of palaeobotanical studies.

Unit-5.

1. Classification of plant fossils. Nomenclature and concept of genera and species.
2. Plant fossils, major divisions of Geologic - times.

3. Anatomy, systemetic position ,environmental significance and geo logical range of important plant genera.
4. Evolution of floring plants. Dendrochronology. Application of palaeobotany with perticular reference to stratigraphic correlation and palaeclimates.

Book - Recommended.

1. Romer, A.S. 1966: Vertebrate palaeontology (3rd ad) Chicago press University.
2. Olson, E.C. 1971: Vertebrate Palaeozoology: Jhon Wilay.
3. Benton, M.J. 1990: Vertebrate Palaeontology, Unwin Hyman.
4. Arnold C.A. 1947: an Introduction to Palaeobotany - Jhon Wiley.
5. Andrews, Jr, H.N. 1961: Studies in Palaeobotany - Jhon Wiley.
6. Seward, A.C. 1991: Plant life through Ages- Cambridge Uni. Press.

**Practical - Paper - I
Environmental and Hydrogeology**

M.M.50

Environmental Geology

1. Study of Siesmic and flood prone areas in india.
2. Analysis for Alkanlinity. Acidity (PH) and conductivity (Electrical) in water sample.
3. Classification of ground water for use in drinking irrigation and indust-rial purpose.
4. Presentation of chemical analysis data and plotting chemical class-ification diagram.
5. Evalauton. of environmental impact of air Pollution ground water. la-ndsides.deforestation, cultivation and building construction in speci-fied areas.

Hydrogeology

1. Delieation of hydrogeological boundaries on water table contour maps and estimation of permeability .
2. Analysis of hydrographs and estimation of infiltration capicity.
3. Pumping Test : - Time Drawdown and time recovery tests and evalua-tion of equifer parametres.
4. Electri resistivity sounding for delineation of fresh and saline aquif-ers.

5. Study of geophysical well logs .Estimation of T.D.S. Using resistiv-ity and sp logs.
6. Excercises on ground water exploration using remote sensing techni-ques.

**Practical - Paper - II
Geophysical Exploration Engineering Geology
and Mining - Geology.**

M.M.50

1. Study of gravimetre. magnetometre and siesmograph.
2. Resistivity Survery.
3. Interpretation of underground structures on the basis of seimic data.
4. Study of properties of common rocks with refrence to their utility in engineering projects.
5. Study of maps & models of important engineering structures as Dam-site, tunnles.
6. Interpretation of Geological maps for landslide problems.
7. Excercises on mine - sampling and determination of tenor, cut off grades and more reserve.
8. Diagramatic representation of open and underground mining methods. mining survey.

**Practical Paper - III
Fuel Geology and ore- Geology**

M.M.50

1. Megascopic characterization of Banded Coals.
2. Proximate analysis of coal.
3. Completion of outcrops in given maps and calculation of coalreserves.
4. Preparation of particulate amounts of coal.
5. Microscopic examination of polished coal pellets. (identification of macerals in coal).
6. Megascopic and microscopic study of cores and well cuttings.
7. Study of geological maps and sections of important oilfield of India and world, calculation of coar reserves.
8. Study of geological sections of U-Th bearing rocks of the country . Megascopic study of some Uranium and Thorium bearing mineral and rocks.

9. Megascopic study of structure and fabrics of different ores and their associations.
10. Mineralogical and textural studies of common ore minerals under ore microscopes.

**Practical paper IV
Elective Paper**

M.M.50

A (Advance - Remote sensing in Geology)

1. Study of nature of Aerial photographs; resolution symbols, gully pattern and drainage analysis.
2. Exercises on MSS T.M. Radar & Spot Images for geological Geomorphological purpose.
3. Photo interpretation of structural and Land Form elements.
4. Visual Interpretation of satellite images.
5. Geomorphological mapping and terrain evolution through photogeological studies.
6. Application of Remote sensing techniques in site selection of dam & tunnel sites.
7. Interpretation of imageries in context with pedology & forestry.
8. Acquaintance with geographic information system, data analysis and data representation and technique of data integration.

**Practical Paper - IV
Elective Paper**

B. [Sedimentary Environment and sedimentary Basin]

1. Study of primary, secondary and biogenic sedimentary structures in hand specimens, in photographic atlas, field- photographs and wherever possible on the outcrop.
2. Exercises related to palaeocurrent data from different environments.
3. Tilt correction of palaeocurrent data.
4. Exercises related to analysis and interpretation of depositional sedimentary environment using, actual case histories from the Indian stratigraphic records.
5. Determination of porosity in clastic and carbonate rocks.
6. Staining and mineral identification in carbonate rocks.

7. Detailed study of diagenetic features in the thin sections, microscopic study of heavy minerals.
8. Exercises on mineralogical and geochemical data plots for environmental interpretations.

**Practical Paper - IV
Elective Paper**

c. [Vertebrate palaeontology and palaeobotany]

1. Study of important vertebrate fossils from Gondwana rocks, Siwalik rocks.
2. Distribution of vertebrate life through geological Ages - preparation of evolutionary Faunal migration maps.
3. Study of vertebrate teeth, Skeletons.
4. Diagrammatic representation of evolutionary trend of Equidae proboscidea.
5. Diagrammatic representation of evolution of plants through geological ages.
6. Morphological studies of important plant fossils.
7. Study of palaeobotanical data to decipher evolution of plant life.
8. Application of palaeobotanical data with reference to stratigraphic correlation and palaeoclimates.

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