FOLDER-3

बिलासपुर विश्वविद्यालय

बिलासपुर (छत्तीसगढ़)

पाठ्यक्रम

परीक्षा : 2014

:: प्रकाशक ::

कुलसचिव बिलासपुर विश्वविद्यालय

बिलासपुर (छत्तीसगढ़)

M.Sc. (Previous) Session 2007-08
Geology

GENERAL -

There shall be five theory papers and four practicals in the exaimation of M.Sc. (Previous) Fifth practical paper will cover field work and report writing followed by Viva-Voce.

THEORY EXAMINATION -

Each theory paper shall be of three hours duration. Students shall have to solve five questions in each theory paper of which one shall be objective type covening the entire course of corresponding paper.

Each paper will be divided into five units. Two questions 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 units only.

PRACTICAL EXAMINATION -

Each practical examination shall be of three to five hours duration. 20% marks shall be devoted to sessional works done during the studying of courses in academic year. 10% marks shall be devoted to viva-voca.

The student shall have to pass in the total of theory and practical examinations separately.

FIELD-WORK -

Field-work is an integral part of the course. There would be at least 3 weeks duration of field work. On completion of field work. Student shall have to submit a comprehensive field report.

The valuation of the field report will be done under practical group IV in M.Sc. previous examination.

M.Sc. (Previous)
THEORY

Paper	Title and alloted units	M.M.
I	Structural Geology (2 units) Remotesensing in Geology and Geomorphology (3 units)	100
II	Minoralogy (1 units) Geochemistry (2 units) Instrumentation and Analytical Techniques (2 units)	100
III	Palaeobiology and Stratigraphy (2.5 units each)	100
IV	Igneous and metamorphic petrology (2.5 units each)	100
V	Sedimentology (3 units) and Tectonics (2 units)	100
	Practical Total	500

I	Structural Geology, Geomorphology and Remote Sensing.	50
II	Mineralogy & Petrology	50
III	Palaeobiology, Stratigraphy and Geochemistry	50
IV	Field work (21 days), field report, Analytical techniques	50
	Total Marks	200
	Theory 500	
	Practical 200	
	Grand Total	700

PAPER-I : STRUCTURAL GEOLOGY, GEOMORPHOLOGY AND REMOTE SENSING

STRUCTURAL GEOLOGY -

1.1 Mechanical principles and properties of rocks and their controlling factors.

1.2 Types of stress ellipses and ellipsoids, their properties and geological significance.

1.3 Mechanics of folding and buckling. Fold development and distribution of strain in fold.

1.4 Fractures and joints : their nomenclature, agerelationship- origin and significance.

2.1 Dynamics of faulting, strike-Slip faults, Overthrust.

2.2 Concept of petrofabric and symmetry : objective, field and laboratory techniques, Graphic treatment.

2.3 Types of fabrics, fabric elements and interpretation of fabric data.

2.4 Geometrical analysis of simple and complex structure on macroscopic scale.

REMOTE SENSING :

3.1 Principles of remote sensing : general idea about electromagnetic spectrum, aerial photographs and their geometry.

3.2 Photogrammetry, recent advancement and applications.

3.3 Different - sattelite expoloration programmes and their characteristics : LANDSAT, METEOSAT, SEASAT, SPOT, IRS.

3.4 Image interpretation and digital processing techniques.

REMOTE SENSING IN GEOLOGICAL STUDIES -

4.1 Image characters and their relation with ground object based on tone, texture and pattern.

4.2 Principles of terrain analysis, evaluation of ground water potential.

4.3 Rock type identification and interpretation of topographic and tectonic features.

REMOTE SENSING IN GEOMORPHOLOGICAL STUDIES -

5.1 Geomorphic processes and resulting land forms and their discrimination on photos and Image.

5.2 Morphonetric analysis. Geomorphological mapping based on gensis of Land forms.

5.3 Terrain evaluation for strategic purpose. Principles and application of Geographic information system.

BOOKS RECOMMENDED -

- Ramsay, J.G. 1967 : Folding and racturing of Rocks, McGraw Hill.
- Hobbs, B.E., Means, W.D. and Williams, P.F. 1976, An outline of structural Geology, Jhon Willety.
- Davis, G.R. 1984, Structural Geology of Rocks & Region - Jhon Willey.
- Ghosh, S.K. 1995 : Structural Geology fundamentals of modern developments Pergramon Press.
- Ramsay, J.G. and Huber, M.I. 1987 : Modern Structure Geology, Vol I. & Vol. II Academic Press.
- Ray, R.G. 1969 : Aerial Photographs in Geological Interpretations USGS, Prof. Paper 373.
- Sabbins, F.F., 1985 Remote Sensing - Principles & Applications Freeman.
- Miller, V.C. 1961 : Photogeology, McGraw Hill.
- Lilesand, T.M. and Kieffer, R.W. 1987 : Remote Sensing and Image Interpretation, John Willey.
- Pandey, S.N. 1987 : Principles and Applications of Photogeology Willey, Eastern New Delhi.
- Gupta , R.P. 1990 : Remote Sensing Geology, Springer Verlag.

PAPER II : MINERALOGY INSTRUMENTATION AND ANALYTICAL TECHNIQUES GEOCHEMISTRY

MINERALOGY, INSTROMENTATION AND ANALYTICAL TECHNIQUES GEOCHEMISTRY

Systematic study of following group of minerals with special emphasis of their atomic structure, mineral chemistry, P.T. stability and mode of occurrance.

1.1 Sillicates : Silica, Felspar, Pyroxene, Amphibole, Mica.

1.2 Native Elements : Diamond, Gold, Copper, Minerals. Platinum.

1.3 Sulphides : Galena, Sphalerite,

1.4 Oxide; hydroxides & carbonates : oxide of semi-metals - Arsenic, Tungsten, oxides of metals - corumdum, chromite. carbonates - calcite, cerussite.

1.5 Mineral assemblages, Gem Minerals.

INSTRUMENTATION & ANALYTICAL TECHNIQUES :

2.1 Sampling & Sample preparations, thin section & polished section making,

2.2 Sample etching, staining and model count techniques.

2.3 Tehniques in photomicrography.

2.4 Principles and geological application of thermoluminiscence.

3.1 Principles and geological application of atomic-absorption spectrophotometry, spectrometry.

3.2 Principles and geological application of X-ray fluorescence spectrometry.

3.3 Principles and geological application of scanning & electron-microscopy,

3.4 Principles and geolcgical application of X-ray diffractometry,

GEOCHEMISTRY -

4.1 Origin & abundrance of elements in the solar-system and in the earth, and its constituents.

4.2 special-properties of transition & rare-earth-elements. Geochemical-Classification of Elements.

4.3 Radiogenic-isotopes. Radioactive decay-schemes of U-pb, K-Ar and growth of daughter isotops Radiometric dating of simple mineral and whole rock.

4.4 Stable isotopes : Nature, abundance, and fractionation.

5.1 Laws of thermodynamics : concept of free-energy, activity, fugacity and equillibrium constant.

5.2 Thermodynamics of ideal, Non-ideal and dilute solutions principles of ionic-substitution in minerals.

5.3 Elements partitioning in mineral/rock formation and concept of simple-distribution-coefficient and exchange reaction distribution coefficients.

5.4 Elements partitioning in mineral assemblage and its use in pressure-temperature estimation.

5.5 Chemistry of natural waters. Mineral stability in Eh-pH diagram. Rock-weathering & soil formation.

BOOKS RECOMMENDED -

- Deer, W.A., Howie, R.A. & Zussman, J. 1996 : The Rock-Forming Minerla,s Longman.
- Klien, C. and Hurbut, Jr. C.S. 1993 : Manual of Mineralogy. Jhon, Willey
- Putnis, Andrew, 1992 : Introduction to mineral sciences. Cambridge University Press.
- Spear, F.S. 1993 : Mineralogy Phase equillibria and Pressure - Temperature, Time path, Mineralogical Society of America.
- Phillips, W.M. and Griffen, D.T. 1986 Optical Mineralogy, CBS Edition.
- Hutchinson, C.S. 1974 : Laboratory Hand books of Petrographic Techniques-Jhon Willey.
- Mason, B. & Moore, C.B. 1991 : Introduction to Geochemistry Willey-Eastern.
- Faure, G. 1986 : Principles of Isotope Geology, John Willey.
- Hoefs, J. 1980 : table Isotope Geochemistry , Springer Verlay.
- Marshal, C.P. And Fair bridge, R.W. 1999 - Encylopaedia of Geochemistry, Kluwer Academic.
- Govett, G.J.S. (Ed) 1953 : Handbook of Exploration-Geochemistry Elsevier.
- Nordstrom, D.K. and Munoz, J.L. 1986 : Geochemical Thermodynamics, Blackwell.

PAPER-III : PALEOBIOLOGY & STRATIGRAPHY

PALAEOBIOLOGY -

1.1 Species concept, Biometrics, Molecular Systematics, Phlogenetic Analysis.

1.2 Mechanism of evolution; origin of life; origin of metazoans.

1.3 Major events in the history of precambrian and phanerozoic life

1.4 Growth & allometry.

1.5 Theoritical morphology : Functional morphology and evolutionary trends in-cephalopoda

2.1 Mollusca : Gabropoda, Lamillibranchia,

2.2 Brachiopoda.

2.3 Echinodermata.

2.4 Trilobita

3.1 Taphonomy, limiting, environmental factors.

3.2 Stable isotopes and palaeoclimates. palaeogeographic provinces.

3.3 Classification and significacne of vertebrate paleonotology micropalaeontology.

STRATIGRAPHY -

4.1 Controls on the development of stratigraphic records.

4.2 Lithostratigraphy, correlation and stratigratphic code.

4.3 Biostratigraphy; Quantitative stratigraphy

4.4 Megnetostratigraphy, Cyclostratigraphy, event stratigraphy.

5.1 Pedostratigraphy, siesmic stratigraphy and sequence stratigraphy.

5.2 Geochronology & Chronostratigraphy.

5.3 Geophysical and chemostratigraphic correlation.

5.4 Completeness/incompleteness of stratigraphic records : Preservation and net-rates of accumalation in various basinal settings.

6.1 Study of palaeogeography of Indian subcontinent.

6.2 Study of Palaeoclimate Igneues and mountain building activites in the indian subcontinent.

BOOKS RECOMMENDED -

- Clarkson, E.N.K. 1998 : Invertebrate Palaeontology and evolution IInd. 'Blackwell'.
- Stearn, C.W.. Caroll, R.L. 1989 : Palaeontology - the record of life Jhon Willey.
- Smith, A.B., 1994 : Systematics and the fossiterecord-Documenting Evolutionary patterns - Blackwell.
- Boggs, Sam, Jr. 1995 : Principles of Sedimentology & Stratigraphy, Prantice Hall.
- Bremer, R.E. and Mchargue, T.R. 1958 : Integrative Stratigraphy. Concept and applications, Prentice Hall.
- Hagui, S.M. & rogors, J.J.W. 1987 : Precambrian Geology of India Oxford Univ. Press.
- Pascoe, E.H. 1968 : A Manual of Geology of India & Burma Vol. I-IV Govt. of India, Press.

PAPER-IV : IGNEOUS & METAMORPHIC PETROLOGY

IGNEOUS PETROLOGY -

1.1 Physics of magma generation in the mantle, their nature. Factors affecting evolution of magma.

1.2 Phase equillibrium of single and Binary silicate system.

1.3 Phase equillibrium of Ternary and Quaternary silicat system.

1.4 Phase equillibrium and its relation to major genesis and crystallization in the light of modern experimental work.

2.1 Criteria for classification of igneous rocks. Norms, CIPW and Niggli values, Zavaritskii No.

2.2 Rock-suit, series : Petrographic provinces and associations.

2.3 Petrogenesis of major igneous rock types such as ultramafics/

2.4 Petrogenesis of Basalt, granite and alkaline rocks.

METAMORPHIC PETROLOGY -

3.1 Minerlogical phase rule of closed and open system.

3.2 Detailed description of each facies of low pressure, medium to high pressure and very high pressure with special reference to characteristics metamorphic zones.

3.3 Nature of pressure - temperature condition in metamorphism.

3.4 Nature of metamorphic reaction in metamorphism. Isoreactiongrad, schreinmakers rule and construction of petrogenetic grid.

4.1 Metamorphic differentiation.

4.2 Anatexis and origin of migmetites in light of experimental studies.

4.3 Regional metamorphism and paired metamorphic belt in reference to plate-tectonics.

4.4 Pressure temperature time paths. Ultra high temperature, ultra-high pressure and ocean-floor metamorphism.

BOOKS RECOMMENDED -

- Turner, F.J. 1980 : Metamorphic petrology, McGraw Hill, New York,
- Peruchuk, L.L. and Kushiro, I. (eds) 1991 : Physical chemistry of Magmas. Springer Verlay.
- Bose, M.K. 1997 - Igneous Petrology, World Press.
- McBirney, A.R. 1993 : Igneous petrology Jones & Bartlel-pub.

- Bucher, K. and Frey, M. 1994 : Petrogenesis of metamorphic rocks-springar-verlag.
- Kretz, R. 1994 : Metamorphic crystallization, Jhon, Willey.

PAPER-V : SEDIMENTOLOGY AND TECTONICS

SEDIMENTOLOGY -

1.1 Earth surface-system : liberation & flux of sediments processes of transport.

1.2 Generation of sedimentary structures, their classification; control on sedimentary rock record.

1.3 Sedimentary environment & facies.

1.4 Continental, alluvial-fluvial, lacustrine, sedimentary system.

2.1 Desert, aeolian and glacial sedimentary systems.

2.2 Shallow coastal clastics, shallow water carbonates,

2.3 Marine & continental evaporites.

2.4 Deep sea basins. Volcanoolastic Palaeocurrent and basin analysis.

3.1 Evolution of sedimentary basins : tectonics and sedimentation.

3.2 Clastic petrofacies. Palaeoclimate and Palaeoenvironmental analysis.

3.3 Application of trace element, rare-earth element and stable isotope geochemistry to sedimentological problems.

3.4 Diagenesis and fluid flow. Diagenesis of mudstones and carbonate rocks : changes in mineralogy, Fabric and chemistry.

TECTONICS :

4.1 Plate-tectonics : recent advancements, pros & cons.

4.2 Dynamic evolution of continental and oceanic-crust.

4.3 Tectonics of precambrian-orogenic belts of India.

4.4 Formation of mountain roots. Anatomy of orogenic belts.

5.1 Structure and origin of the Alpine-Himalayan belt

5.2 Structure and origin of the Applachian-Caledonian belt.

5.3 Tectonics of Andes, rocky (N. American Cordillera)

5.4 Study of map projections.

BOOKS RECOMMENDED -

- Nicholas, G. 1999 : Sedimentology & stratigraphy, Blackwell.
- Reading, H.G. 1996 : Sedimentary environments, Blackweell.
- Davis, R.A. Jr. 1992 : Depositional-System Prentice-Hall.
- Miall, A.D. 2000, Principles of sedimentary Basin Analysis Springer Verlag.
- Sengupta S. 1997 Introduction to sedimentology, Oxford IBH.
- Bhattacharya A, and Chakraborti 2000 : Analysis of sedimentary successions, Oxford IBH.

- Blatt, H. Murray G.V. and Middleton, R.C. 1980 : Origin of Sedimentary rocks.
- Pettisjon, F.J. Potter, P.E. and Siever, R. 1990 : Sand and Sandstone, Springer - Verlag.
- Morres, E. and Twiss, R.J. 1995 : Tectonics Freeman.
- Keary, P. And Vine, F.J. 1990 : Global Tectonics, Blackwell.
- Storetvedt, K.N. 1997 : Our evolving planet : Earth's History in New Perspective : Bergen (Norway)
- Valdia, K.S. 1998 : Dynamic Himalaya University Press Hydrabad.
- Summer Field, M.A. 2000 : Geomorphology and Global Tectonics Springer Verlag.

PRACTICAL GROUP-I : STRUCTURAL GEOLOGY, GEOMORPHOLOGY AND REMOTE SENSING.

1. Preparation and interpretation of Geological maps and sections.
2. Study of large scale tectonic features of earth.
3. Study of topographic maps of selected areas, drainage pattern, drainage density and frequency bifuracation ratio, slope studies.
4. Study of nature of aerial photographs : resolution, mosaics, symbols, gully pattern and drainage analysis,
5. Determination of scale, height, dip, slope, vestical exaggeration and image-distoration.
6. Exercises on Mss. T.M. Radar & Spot, Images for geological, Geomorphological Purposes.
7. Viva-Voce.

PRACTICAL GROUP-II : MINERALOGY & PETROLOGY

1. Microscopic study of rock-forming minerals using optical accessories. Exercise on thin section and polished section making, etching and staining.
2. Study and interpretation of X-ray diffractograms of common minerals.
3. Megascopic and microscopic study of igneous lithotypes. Calculation of CIPW Norms. Preparation of variation-diagrams.
4. Megascopic and Microscopic study of metamoystic rocks of different facies. Graphic construction of ACF, AKF, and AFM diagrams.
5. Study of petrography of clastic & Non clastic rocks. Exercises related to palaeocurrent analysis from different environment

Determination of porosity in clastic & carbonate rocks. Staining and mineral identification in carbonate-rocks,.

6. Study of primary, secondary and biogenic sedimentary structures in Hand specimens; field photographs.

7. Viva-Voce.

PRACTICAL GROUP III : PALAEOBIOLOGY STRATIGRAPHY-GEOCHEMISTRY

1. Recognition of fossil group in an assorted assemblage and identification of their classes
2. Study of important fossils from Indian stratigraphic horizons.
3. Measurement of dimensional parametres and preparation of elementary growth curves and scatter-plots.
4. Exercises on stratigraphic classification and correlation. Exercises on interpretation of siesmic record for stratigraphic study of paleogeographic maps of all geological periods.
5. Rocks/soil/sediments/water analysis using instrumentation & Analytical techniques.
6. Calculation of mineral formula from oxide analysis in minerals. Calculation of weathering Indices in soil and sediments, presentation of analytical data.
7. Viva-Voce.

PRACTICAL GROUP IV : FIELD WORK (21 DAYS)

1. Accomplish given field work under the guidance of Professor Incharge.
2. Documentation, Presentation of detailed field report.
3. Viva-Voce on field study and field report.

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