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UNIVERSITY OF MYSORE

Estd. 1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysuru- 570 005

No.AC.2(S)/31/18-19

Dated: 15.06.2018

NOTIFICATION

Sub: Revision of syllabus for Earth Science (UG) as per CBCS pattern from the academic year 2018-19.

Ref: 1. Decision of Board of Studies in Earth Science (UG) meeting held on 02.03.2018 & 03.03.2018.
2. Decision of the Faculty of Science & Technology Meeting held on 21.04.2018.
3. Decision of the Deans Committee meeting held on 22.05.2018.

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The Board of Studies in Earth Science (UG) which met on 2rd March 2018 & 3rd March 2018 has recommended to revise the syllabus for B.Sc. Earth Science as per CBCS pattern from the academic year 2018-19.

The Faculty of Science and Technology and the Deans committee meetings held on 21-04-2018 and 22-05-2018 respectively have approved the above said proposal with pending ratification of Academic Council and the same is hereby notified.

The CBCS syllabus of B.Sc. Earth Science course is annexed. The contents may be downloaded **from the University Website i.e., www.uni-mysore.ac.in**.

Draft approved by the Registrar

15/6

Deputy Registrar(Academic)

To:

1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Dean, Faculty of Science & Technology, DOS in Physics, Manasagangotri, Mysore.
3. The Chairperson, BOS in Earth Science, DOS in Earth Science, Manasagangotri, Mysore.
4. The Chairperson, Department of Studies in Earth Science, Manasagangotri, Mysore.
5. The Director, College Development Council, Moulya Bhavan, Manasagangotri, Mysore.
6. The Principals of the Affiliated Colleges where UG Program is running in Science stream.
7. The Deputy/Assistant Registrar/Superintendent, AB and EB, UOM, Mysore.
8. The P.A. to the Vice-Chancellor/Registrar/Registrar (Evaluation), UOM, Mysore.
9. Office file.

PROCEEDINGS OF THE BOS MEETING IN GEOLOGY (UG) HELD ON 2nd and 3rd of March, 2018 at DOS IN EARTH SCIENCES, UNIVERSITY OF MYSORE, MYSURU.

Dated: 03.03.2018

Place: Mysore-6

Members Present:

1. Dr. Madesh P Chairman:
2. Dr. Janardhana M R Member:
3. Dr. Suresha S Member:
4. Dr. Jagannathappa M N Member:
5. Dr. Manjunath S Member:
6. Dr.Satish Kumar G Member:

Members Absent: Nil

Chairman, BOS in Earth Sciences (PG and UG), welcomed the members to the meeting and presented the agenda. The proceedings of the meeting are as follows.

1. Regarding introduction of CBCS pattern in undergraduate course.

   The Board of Studies (BOS) in Earth Science (UG) at its meeting held on **2nd and 3rd of March, 2018** recommends the distribution of credit pattern with a modified syllabus under " CBCS & CAGP REGULATIONS 2018" to be considered for the implementation from the academic year 2018-19 onwards for B.Sc., in Geology.

2. **Syllabus for the B.Sc., course in Geology of the University of Mysore, under** CBCS & CAGP REGULATIONS 2018.

(a) The approved syllabus as per "CBCS & CAGP REGULATIONS 2018" of the university of Mysore for I, II, III and IV semesters in the course of Geology along with model question papers are annexed herewith.

(b) It was resolved that the syllabus for the remaining semesters (V and VI semesters) will be framed and approved in the next BOS meeting.

3. Any other matter: Nil

Chairman thanked all the members for their participation and contribution in framing the syllabus for I, II, III and IV semester B.Sc.

A MODIFIED SYLLABUS IN THE COURSE OF B.Sc., GEOLOGY (THREE YEAR – SIX SEMESTER SCHEME) WITH NEW - "CBCS & CAGP REGULATIONS 2018**"**

The Board of Studies (BOS) in Geology (UG) at its meeting held on **2nd and 3rd of March, 2018** recommends the distribution of credit pattern with a modified syllabus under "CBCS & CAGP REGULATIONS 2018" to be considered for the implementation from the academic year 2018-19 onwards for B.Sc., in Geology. The modified syllabus for I, II, III and IV semesters in the course of Geology is annexed herewith.

Name of the Course : Geology
Program: B.Sc.

Semester	Course	Core Course	LTP	Credit value	Remarks
I	DYNAMICS OF THE EARTH	DSC	400	4	
	PRACTICAL - 1	DSC	001*	2	
11	MINERAL SCIENCE	DSC	400	4	
	PRACTICAL - 2	DSC	001*	2	
III	PETROLOGY	DSC	400	4	
	PRACTICAL - 3	DSC	001*	2	
IV	PALAEONTOLOGY AND STRATIGRAPHY	DSC	400	4	
	PRACTICAL - 4	DSC	001*	2	

*** Each Practical is of 4 hours duration (2 hour practical=1 Credit)**

SYLLABUS
(With New Regulations - CBCS & CAGP REGULATIONS 2018**)**

I SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
CORE COURSE: DYNAMICS OF THE EARTH

Total Teaching Hours: 64 **LTP/Credits: 400/4**
Teaching Hours: 4/Week. **Exam. Marks Total: 100**
Exam. Duration: 3 Hrs. **(C_1-10 mark: C_2-10 mark: C_3-80 mark)**
(C_1 Test -10 mark: C_2 Test -10 mark: C_3 Main Exam-80 mark)

Unit-1
GEOLOGY- FUNDAMENTALS **16 hours**

Definition of Geology, relationship with other branches of Science, importance, scope & different branches of Geology.
General characteristics and origin of the Universe – Big Bang theory
Solar System and its planets. The terrestrial and jovian planets.
Meteorites and Asteroids
Components of Earth System: atmosphere, lithosphere, hydrosphere, biosphere.
Origin of Earth: Nebular hypothesis, planetesimal, Tidal and Meteoritic hypothesis.
Age of the Earth: Radiometric methods (Rb-Sr, U-Pb, Sm-Nd, Pb-Pb) of age determination.
Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere
Convection in Earth's core and production of its magnetic field

Unit – 2 **16 hours**

GEOMORPHOLOGY -1
Definition. Weathering: Types, Mechanical, Chemical and Biological weathering.
Soils- processes of formation, soil profile and soil types.
Geological agents: definition, classification – a) Epigene and b) Hypogene
EPIGENE AGENTS:
Wind: Geological action of wind, deflation, abrasion, attrition, erosional features- pedestal rock, transportation- suspension, saltation, traction, deposition-sand dunes, barchans, loess.
Rivers: stages of rivers- young, mature and old. Geological action of rivers: Erosion – hydraulic action, abrasion, attrition. Erosional features- pot holes, V-shaped valleys, waterfall, canyons, base level erosion, meanders, ox-bow lakes, transportation- suspension , solution, deposition- alluvial fans & deltas.

Unit – 3 **16 hours**
GEOMORPHOLOGY -2
Oceans: topography of ocean floor – continental slope, shelf, abyssal zone, mid-oceanic ridges. Waves, Tides, Currents and circulation of water. Geological work of oceans – erosion, Transportation, Deposition. Coral reefs; Types of reefs – Fringing, Barrier, Atoll.

Glaciers: movement of Glaciers, Types of glaciers – Valleys, piedmonts, Icecaps. Geological action of glaciers: Erosion – Abrasion, Excavation, Frost wedging. Erosional features – Cirques, U-shaped valleys, Hanging valleys, Transportation – Glacial drift. Deposition – Morains and Tillites.

HYPOGENE AGENTS: An introduction- Groundwater, Earthquakes and volcanoes.

G**round water:** Geological action of ground water- erosional features – sinks, caverns, solution valleys – transportation – solution, depositional features – concretions, stalactites and stalagmites.

Unit – 4 **16 hours**

GEODYNAMICS

Geodynamic elements of Earth- Mid Oceanic Ridges, trenches, transform faults and island arc. Origin of oceans, continents, mountains and rift valleys

Plate tectonic theory: Plates and their margins, constructive margin, destructive margin, Continental plate boundaries, ocean – ocean plate boundaries, causes of movement of the plates, Paleomagnetism, seafloor spreading and hot spots.

Earthquakes: nature of seismic waves, their intensity and magnitude scale; Origin of earthquake; and earthquake belts

Volcanoes- types, products and their distribution.

SUGGESTED READINGS:

1.Duff, P. M. D., & Duff, D. (Eds.). (1993). *Holmes' principles of physical geology*. Taylor & Francis.

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.

4. Principles of Geology – Arthur Holmes
5. Physical Geology – Longwell & Flient
6. General Geology – Radhakrishnan. Y
7. The Dynamic Earth – Wyllie. P.J
8. The way earth works - Wyllie. P.J
9. Physical Geology – Springfield
10. Geomorphology – Thornbury
11. Geomorphology – Davies
12. Physical Geography Today – Muller & Oberlander

I SEMESTER B.Sc. DEGREE PROGRAMME

GEOLOGY

PRACTICAL-1

Total Teaching Hours: 64 **LTP/Credits: 001/2**

Teaching Hours/Week: 4 **Total Marks: 50**

Exam. Duration: 3 Hrs.

(C_1 Assignment -5 mark: C_2 Seminar -5 mark: C_3 Main Exam-40 mark)

*Study of major geomorphic features and their relationships with outcrops through physiographic models. 3 practicals

* Reading topographical maps of the Survey of India; Detailed study of topographic sheets, Identification of geomorphic features and preparation of physiographic description of an area –topography/drainage pattern/ Land use and land cover 3 practicals

*Study of soil profile and determination of soil texture 2 practicals

*Study of aerial photographs : Identification of landform features 3 practicals

*Study of landforms in the field. 4 practicals

MODEL QUESTION PAPER FOR C_3

I B.Sc., I Semester Examination

GEOLOGY

Paper: DYNAMICS OF THE EARTH

Time: 3 Hour Max. Marks: 80

SECTION : A

Answer any FIVE questions 5 X 2 = 10 Mark

1.
2.
3.
4.
5.
6.

SECTION : B

Answer any SIX questions 6 X 5 = 30 Mark

7.
8.
9.
10.
11.
12.
13.
14.

SECTION : C

Answer any FOUR questions 4 X10 = 40 Mark

15.
16.
17.
18.
19.
20.

MODEL QUESTION PAPER

I B.Sc., I Semester Examination

GEOLOGY PRACTICAL- I

Time: 3 Hour Max. Marks: 40

Determination of the soil texture and report writing . 8 mark

Identification of the landform feature from the aerial photograph and report writing 8 mark

Interpretation and description of a physiographic model. 7 mark

Interpretation and description of a part of a toposheet as regard to topography, slope and drainage. 7 mark

Lab Record=10 mark

II SEMESTER B.Sc. DEGREE PROGRAMME

GEOLOGY

CORE COURSE: MINERAL SCIENCE

Total Teaching Hours: 64 **LTP/Credits: 400/4**

Teaching Hours: 4/Week. **Exam. Marks Total: 100**

Exam. Duration: 3 Hrs. **(C_1-10 mark: C_2-10 mark: C_3-80 mark)**

(C_1 Test -10 mark: C_2 Test -10 mark: C_3 Main Exam-80 mark)

Unit 1: Crystallography 16 Hrs.

Crystals and their characters:

Elementary ideas about crystal morphology in relation to internal structures

Crystal form, face, edge, solid angle; Euler's formula.

Crystal parameters and Weiss and Miller system of notations

Crystallographic axes and angles.

Crystal symmetry. Classification and Description of normal class of Isometric, Tetragonal, Hexagonal, Orthorhombic, Monoclinic and Triclinic systems

Unit 2: Rock forming minerals 16 Hrs.

Minerals - definition and classification, physical properties; habit, form, colour, streak, luster, diaphaneity, iridescence, cleavage, fracture, hardness, tenacity

Opalescence, Luminescence, Fluorescence, tarnish, Specific gravity

Study on the following group of rock-forming minerals: Quartz, Feldspar, Mica, Amphibole, Pyroxene and Olivine.

Silicate and non-silicate structures; CCP and HCP structures

Unit 3: Optical microscopy 16 Hrs.

Nature of light, Nomenclature of wave theory, reflection and refraction of light, Refractive index, Critical angle, Total reflection.

Principles of optical mineralogy

Introduction to the petrological microscope.

Double refraction- Isotropic and Anisotropic crystals, Polarisation of light. Behaviour of light under crossed nicols with mineral section.Common optical properties observed under ordinary, polarized lights and crossed nicols.

Unit 4 :Optical accessories 16 Hrs

Mica plate, Gypsum plate and Quartz wedge (construction and use). Pleochroism (Dichroism, Trichroism) Interference colours, Michael Levy's chart. Order of Interference colour, Extinction- Straight, inclined, undulose and symmetrical extinctions. Extinction angle.

SUGGESTED READINGS:

1. Klein, C., Dutrow, B., Dwight, J., & Klein, C. (2007). The 23rd Edition of the Manual of Mineral
2. Science (after James D. Dana). J. Wiley & Sons.

3. Kerr, P. F. (1959). Optical Mineralogy. McGraw-Hill.
4. Verma, P. K. (2010). Optical Mineralogy (Four Colour). Ane Books Pvt Ltd.
5. Deer, W. A., Howie, R. A., & Zussman, J. (1992). An introduction to the rock-forming
6. minerals (Vol. 696). London: Longman.
7. An Introduction to Crystallography – Philips. R.C
8. Elementary Crystallography – Buerger
9. Crystallography & Crystal Chemistry – Evans. R.C
10. Crystal Chemistry – Kutty, T.R.N. & Tareen. J.A.K.
11. Elements of X-ray Crystallography – Azaroff
12. An Introduction to Crystal Chemistry - Evans. R.C
13. Elemental Crystallography - Tareen. J.A.K & Kutty, T.R.N

II SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
PRACTICAL-II

Total Teaching Hours: 64 **LTP/Credits: 001/2**
Teaching Hours/Week: 4 **Total Marks: 50**
Exam. Duration: 3 Hrs.
(C_1 Assignment -5 mark: C_2 Seminar -5 mark: C_3 Main Exam-40 mark)

Observation and documentation on symmetry of crystals 5 practicals
Study of physical properties of minerals in hand specimen 6 practicals
Identification Of The Following Minerals
Based On Their Physical Characters.
Oxides: Corundum
Halides: Fluorite, Halite,
Carbonates: Calcite, magnesite, Siderite, Rhodochrosite, Dolomite, Phosphates: Monazite, Apatite
Sulphates: Barytes, Gypsum.
Silicates: Neosilicates; Olivine, Garnet, Zircon, Andalusite, Sillimanite, Kyanite, Topaz, Staurolite. Sorosilicates: Epidote
Cyclosilicates : Beryl, Tourmaline,
Inosilicates; Pyroxenes – Enstatite, Hypersthene, Diopside, Augite, Amphiboles – Hornblende, Tremolite, Actinolite.
Phyllosilicates: Serpentine, Talc, Muscovite, vermiculite, Phlogopite, Biotite, Epidote, Chlorite.
Tectosilicates: Quartz and its varities, Feldspars – Microcline, Orthoclase, Plagioclase – varities. Feldspathoids, Leucite, Nephelene, Sodalite.

Study and identification of the following ore minerals based on physical properties

3 practicals

Native copper, Graphite, Sulphur, Copper-Chalcopyrite, Azurite and malachite. Arsenic-Realgar and Orpiment. Mercury - Cinnabar. Tin - Cassiterite, Stibnite. Lead-Galena. Zinc - Sphalerite, Iron sulphide -Pyrite. Oxides and Hydroxides - Hematite. magnetite, limonite. laterite Manganese - Pyrolusite and Psilomelane. Aluminium - Bauxite, Titanium-Ilmenite. Wolframite. Hydrocarbons: Coal and its varieties.

Study of some key silicate minerals (quartz; feldspars – orthoclase, microcline, plagioclase; biotite; hornblende; augite and olivine) under optical microscope and their characteristic properties. 2 practicals

MODEL QUESTION PAPER FOR C_3
I B.Sc., II Semester Examination
GEOLOGY
Paper- MINERAL SCIENCE

Time: 3 Hour Max. Marks: 80

SECTION : A
Answer any FIVE questions 5 X 2 = 10 Mark
1.
2.
3.
4.
5.
6.

SECTION : B
Answer any SIX questions 6 X 5 = 30 Mark
7.
8.
9.
10.
11.
12.
13.
14.

SECTION : C
Answer any FOUR questions 4 X10 = 40 Mark
15.
16.
17.
18.
19.
20.

MODEL QUESTION PAPER
I B.Sc., II Semester Examination
GEOLOGY
PRACTICAL-2

Time: 3 Hour Max. Marks: 40

1. Identify the crystal models kept in tray nos. 1- 2 based on their symmetry characters and describe them. 2 X 3 = 6 mark
2. Identify the minerals kept in tray nos. 3 – 7 based on their physical properties and describe them. 5 X 4 = 20 mark
   (Any two from silicate group, one from oxide/hydroxide/sulphide and two from native metal/non-metal/halides/carbonates/sulphate/phosphates).
3. Identify and describe the mineral kept in tray no. 8 based on its optical properties. 1 X 4 =4 mark
4. Lab Record 10 mark

III SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
PAPER: PETROLOGY

Total Teaching Hours: 64 **LTP/Credits: 400/4**
Teaching Hours: 4/Week. **Exam. Marks Total: 100**
Exam. Duration: 3 Hrs. **(C_1-10 mark: C_2-10 mark: C_3-80 mark)**
(C_1 Test -10 mark: C_2 Test -10 mark: C_3 Main Exam-80 mark)

PETROLOGY

16 hours

UNIT 1

Introduction: Definition of a rock. Classification of rocks - Igneous, Sedimentary & Metamorphic rocks. Rock cycle.

IGNEOUS PETROLOGY: Introduction to Igneous petrology. Classification and Nomenclature of Igneous Rocks: Classification of igneous rocks based on grain size – Phaneritic, Aphanitic, Fragmental. Phaneritic rocks classification – fine, medium, coarse and very coarse grained. Classification based on composition – acidic, intermediate, basic & ultrabasic. Classification based on colour Index – Leucocratic, Mesocratic, Melanocratic & Hypermelanic. Classification based on depth – plutonic, hypabyssal and volcanic. Tabular classification of Tyrrell.

Magma: Definition, types and composition. The Process of Magma Rise and Emplacement: Diapir, Room Problem, Stoping, Liquid Immiscibility, Assimilation and Fractional Crystallization, Mixing of Magmas. Crystallization behavior of natural magmas: Bowen's Reaction Principle.

Forms of igneous rocks, extrusives and intrusives: Concordant - sill, laccolith and phacolith. Discordant - dyke, ring dyke, cone sheets, volcanic neck, stock, boss and batholiths.

Unit 2 **16 hrs**

Structures of Igneous rock: Vesicular; Amygdaloidal, Blocky, Ropy, Pillow and Columnar.

Igneous rock Textures:

Texture – Definition. Crystallinity (Holocrystalline, Hypocrystalline and Holohyaline), granularity (Aphanitic , Phaneritic and Cryptocrystalline), Form of Individual Grains (Euhedral, Subhedral and Anhedra) and mutual relationship of crystals. Kinds of textures: Equigranular - Panidiomorphic, hypidiomorphic and allotriomorphic; Inequigranular - Porphyritic, poikilitic, ophitic, basaltic, intergrowth and flow textures. .
One-Component Systems, Two-Component (Binary) Systems – A) Binary Systems with Complete Solid Solution B) Binary Eutectic Systems .
Igneous Rock Associations: An introduction on Igneous rocks of oceanic regions, Igneous rocks associated with convergent plate boundaries, Continental flood basalts and large igneous provinces, Large layered igneous complexes, Continental alkaline rocks, Ultra-alkaline and silica-poor alkaline rocks, Special Precambrian associations, Meteorite-impact-generated rocks.

UNIT 3 **16 hrs**

SEDIMENTARY PETROLOGY

Introduction to sedimentary petrology, weathering and the sedimentary cycle, applications of sedimentology.
Sedimentary Textures: Particles - Particles shape - roundness, Wentworth grade scale, methods of particle size analysis (sieve analysis), methods of measurement of porosity and permeability (field and laboratory methods), porosity and permeability – grain packing and grain orientation, relationship between fabric.
Transportation and Sedimentation: 1. Aqueous processes: Sedimentation from traction currents 2. Eolian processes: Sedimentation from traction and suspension. 3. Glacial processes and 4. Gravitational processes.
Sedimentary Structures: Primary and Secondary structures. Primary structures – A) Organic: Burrows and trails B) Inorganic: Classification of inorganic structures i] pre-depositional – channels, Scour and fill, flute and groove marks ii] syn-depositional – flat bedding, graded bedding, cross bedding and lamination iii] post-depositional – slump, slide, convolute lamination and bedding, recumbent foresets and load structures iv] Miscellaneous – rain prints and shrinkage cracks. Environmental interpretation of sedimentary structures.
Depositional systems: I. Sedimentary Environments; Definition of sedimentary environment, classification of environments of deposition - Terrestrial, Lacustrine, Delta; onshore and offshore, Beach, Tidal flat area; salt marsh, tidal flat and channel, Continental slope and shelf. II. Sedimentary Facies – definition.
Sediment to Rock: Subsurface temperatures, pressures, fluids and cementing material
Genetic classes of sediment – chemical, organic, residual, terrigenous and pyroclastics. Classification of Sedimentary Rocks with examples: I. Allochthonous sediments – Terrigenous and pyroclastic deposits and II. Autochthonous sediments - chemical, organic, residual deposits. Classification of terrigenous rocks based on particle size –Rudaceous, Arenaceous and Argillaceous. .
Sedimentary basins: Generating processes – crustal sag, tension, compression and wrenching.

UNIT 3

METAMORPHIC PETROLOGY **16 hours**

Introduction: Metamorphism – definition; Metamorphic agents - Temperature, pressure, fluids and time. Geothermal gradient.
Types of metamorphism: (A) Contact Metamorphism – Pyrometamorphism (B) Regional Metamorphism - Orogenic Metamorphism, Regional contact metamorphism, Burial Metamorphism, Ocean Floor Metamorphism, (C) Hydrothermal Metamorphism (D) Fault-Zone Metamorphism (E) Impact or Shock Metamorphism (F) Pneumatolytic Metamorphism.
Progressive nature of metamorphism: Prograde and regtrograde.

A Classification of metamorphic rocks and a brief description of : (A) Foliated and Lineated Rocks: Slate, Phyllite, Schist and Gneiss (B) Non-Foliated and Non-Lineated Rocks: Hornfels.
Textures and Structures of metamorphic rocks: (1) Non-Foliated Texture/Structure: Granoblastic , mosaic, Decussate, (2) Texture/Structure of Dynamic Metamorphism: Cataclastic, Mylonitic, Sutured and Augen (3) Texture/Structure of Regional Metamorphism: Foliation, Lineation, Crenulation, Schistose, Gneissose, Layering/banding.
Metamorphic grades: Isograd, Low, Medium, High and Very High. Geothermometry, Geobarometrym, Index Minerals..
Metamorphic facies: Eskola's facies, Greenschist facies, Amphibolite facies, Granulite facies, Eclogite facies.

Effects of metamorphism: Effects of thermal metamorphism on Argillaceous Sediments and calcareous sediments. effects of regional metamorphism on argillaceous sediments and basic Igneous rocks.

- LIST OF REFERENCES

- Richard P. Selley (2000): Applied Sedimentology. Second Edition Academic Press, UK. P. 543
- Ricci Lucchi F (1995): Sedimentographica: A Photographica Atlas of Sedimentary Structures. 2nd Edn., Columbia University Press, New York. P.255.
- Collinson J.D., and Thompson D.B (1988): Sedimentary structures.2nd ed., Allen and Unwin., London p. 194.
- Selley R.C. (1996): Ancient sedimentary environment and their subsurface diagnosis. 4th ed. Chapman & Hall, London. P. 300.
- Reineck H. E.,& Singh I.B., (1980): Depositional Sedimentary Environments. 2nd ed., Springer-Verlag, Berlin., p. 549
- John D. Winter (2010): An Introduction to Igneous and Metamorphic Petrology. Pearson Education, Inc. Published by Pearson Prentice Hall. P. 745
- Principles of petrology: Tyrrell - Chapmann and Hall publications.
- Igneous and Metamorphic petrology: Turner and Verhoogen - 1962, Allied Publishers, Bombay. Metamorphic petrology by Winkler HGF 1987 - Nirosa publications
- Sedimentary rocks by Pettijohn 1984 - CDS Pub\. NEW DELHI
- Sedimentary rocks by Greensmith 1984
- Manual of sedimenlary petrology - Krymbein & Pettijohn
- Petrology of Sedimentary rocks - Folk. R.L.
- Origin of Sedimentary Rocks - Blalt. H, Middleton, G.V. & Murray. R.C.
- Bose, M.K., 1997. Igneous petrology. World press
- Tyrell, G. W., 1989. Principles of Petrology. Methuren and Co (Students ed.).
- Ehlers, WG, and Blatt, H., 1987. Petrology, Igneous, Sedimentary and Metamorphic rocks, CBS Publishers
- . Moorhouse, WW., 1969. The study of rocks in thin sections. Harper and sons.
- Friedman & Sanders, 1978. Principles of Sedimentology. John Wiley and sons.
- Prasad, C., 1980. A text book of sedimentology.
- Sengupta. S., 1997. Introduction to sedimentology. Oxford-IBH.
- Turner, F.J., 1980. Metamorphic petrology. McGraw Hill.
- Mason, R., 1978. Petrology of Metamorphic Rocks. CBS Publ.
- Winkler, H.G.C., 1967. Petrogenesis of Metamorphic Rocks. Narosa Publ.

III SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
PRACTICAL-III

Total Teaching Hours: 64 **LTP/Credits: 001/2**
Teaching Hours/Week: 4 **Total Marks: 50**
Exam. Duration: 3 Hrs.
(C_1 Assignment -5 mark: C_2 Seminar -5 mark: C_3 Main Exam-40 mark)

OPTICAL MINERALOGY: **4 Practicals**
Determination of –
Order of Interference colours,
Extinction (straight, inclined & symmetrical)
Vibration direction and sign of elongation and
Pleochroic (Dichroic, Trichroic) scheme.

PETROLOGY:Megascopy **6 practicals**
Identification of the following Rocks in handspecimens:.
Igneous Rocks: **Plutonic rocks** - Granite, Syenite, Diorite, Gabbro, Dunite, Peridotite; **Hypabyssal rocks** - Granite porphyry, Syenite porphyry. Diorite porphyry, Pegmatite, Dolerite; **Volcanic rocks -** Rhyolite, Trachyte, Andesite, Basalt, Obsidian, Pitchstone
Sedimentary rocks: Conglomerate. Breccia, Sandstone, Shale, Grit. Limestone, Shell limestone, Oolitic limestone
Metamorphic Rocks: Quartzite, Shale. Schists, Gneiss. Marble, Phyllites, Charnockitic granulite and Pyroxene granulites.

Microscopy: identification of the following rocks in thin sections: **6 practicals**
Igneous Rocks: Plutonic - Granite, Syenite Diorite, Gabbro, Dunite; **Hypabyssal** -Granite porphyry, Syenite porphyry, Diorite porphyry, Dolerite & Pegmatite; **Volcanic** - Rhyolite., Andesite, Basalt.
Sedimentary rocks - Sandstone, Limestone (oolitic).
Metamorphic rocks - Quartzite, schist, gneiss, marble, charnockitic granulites

Students will be required to carry out field work for a minimum of three days in a suitable geological area to study the elementary aspects of field geology (Basic field measurement techniques: Bedding dip and strike and visit to the areas of geological interest) and submit a report thereon.

MODEL QUESTION PAPER FOR C_3

II B.Sc., III Semester Examination

GEOLOGY

Paper: PETROLOGY

Time: 3 Hour Max. Marks: 80

SECTION : A

Answer any FIVE questions 5 X 2 = 10 Mark

1.
2.
3.
4.
5.
6.

SECTION : B

Answer any SIX questions 6 X 5 = 30 Mark

7.
8.
9.
10.
11.
12.
13.
14.

SECTION : C

Answer any FOUR questions 4 X10 = 40 Mark

15.
16.
17.
18.
19.
20.

MODEL QUESTION PAPER

II B.Sc., III Semester Examination

GEOLOGY

PRACTICAL-III

Time: 3 Hour Max. Marks: 40

1. Determination of any one from the following three (with procedure): **5 Mark**
   i. Order of Interference colour and Extinction angle.
   ii. Sign of elongation
   iii. Pleochroic scheme.
2. Identify and describe the rocks in hand specimens kept in tray numbers 1 to 5 (one each from plutonic, hypabyssal, volcanic, sedimentary and metamorphic origin). **5x2= 10 Mark**

3. Identify and describe the rocks in thin sections kept in tray numbers 7 to 12 (one each from plutonic, hypabyssal, volcanic, sedimentary and metamorphic origin).
   5x3=15 Mark
4. Lab Record **5 mark**
5. Field report **5 mark**

SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
PAPER: PALAEONTOLOGY AND STRATIGRAPHY

Total Teaching Hours: 64 **LTP/Credits: 400/4**
Teaching Hours: 4/Week. **Exam. Marks Total: 100**
Exam. Duration: 3 Hrs. **(C_1-10 mark: C_2-10 mark: C_3-80 mark)**
(C_1 Test -10 mark: C_2 Test -10 mark: C_3 Main Exam-80 mark)

UNIT I: PALAEONTOLOGY **12 hours**

Definition of a fossil, Types of fossils- index, body, trace, synthetic & pseudofossils, transported and leaked fossils. Fossilization - Factors favourable for fossilization, Fossilization processes and modes of preservation: unaltered hard parts and altered hard parts; Mummification, petrification, permineralisation, carbonisation, recrystallisation, silicification, mould, cast, tracks, trails, borings. Fossil record - Nature and importance of fossil record. .

Taxonomy and Species concept

Species concept with special reference to paleontology, Taxonomic hierarchy. Theory of organic evolution interpreted from fossil record.

Unit 2 **20 hours**

Invertebrates

Introduction to important invertebrates and their morphology, stratigraphy and palaeogeographic singnificance of following groups.

Corals, Brachiopoda Lemellibranchs, Gastropoda, Cephalopods, Trilobites and Graptolites. Significance of ammonites in Mesozoic biostratigraphy and their paleobiogeographic implications.

Vertebrates

A brief outline on the origin and classification of vertebrates – Fishes, Amphibians, reptiles with special reference to origin diversity and extinction of dinosaurs. A very short account of the evolution of man, and horse and their intercontinental migrations.

Paleobotany

Introduction, Gondwana flora of India. Introduction to Ichnology

Micropaleontology: A brief introduction on the organic and inorganic walled microfossils- Foraminifera, Acritarch, Conodont and Brayozoa. Significance and Application of fossils in Stratigraphy .

Biozones, index fossils, correlation

Role of fossils in sequence stratigraphy

An outline on the applications of foraminifera in oil exploration.

Fossils and paleoenvironmental analysis

Fossils and paleobiogeography, biogeographic provinces, dispersals and barriers

Paleoecology – fossils as a window to the evolution of ecosystems

UNIT 3: STRATIGRAPHY - I 16 hours

Introduction to stratigraphy: Definition, relationship with other branches of geology . Principles: Law of order of superposition, Law of uniformitarianism and Law of faunal and floral succession. Imperfections in the geological records. Unconformities and their types. Stratigraphic concepts of correlation-methods of correlation: criteria and methods: a) Physical criteria-Physical and lithological continuity, stratigraphic position, well logging, structural

development, radiometric age. Palaeontological criteria - by index fossils, fossil assemblage and stages of evolution.
Brief introduction and fundamentals of the concepts of lithostratigraphy, biostratigraphy, chronostratigraphy, seismic stratigraphy, chemostratigraphy, Magnetostratigraphy.
Sequence stratigraphy and their subdivisions with Indian examples.
Principles of stratigraphic analysis. Facies concept in stratigraphy - Walther's Law of Facies..
Concept of paleogeographic reconstruction.
Standard stratigraphic scale: Classification of geological record into Eras - Archean, Proterozoic, Palaeozoic, Mesozoic and Cenozoic. A brief study of individual era with regard to their nomenclature, classification, lithology, climate, earth movement and life.

UNIT 4 STRATIGRAPHY - II 16 hours
Physiographic divisions of India - Peninsular, extra-peninsular and Indo-gangetic alluvial plains.
Precambrians
Sargur group and Dharwar super group of rocks – Classification – Bababudan and Chithradurga Group of rocks. Peninsular gneiss: Schist belts of Dharwar Craton – Chithradurga schist belt; distribution and economic importance. .
Distribution, lithology, classification, life, age and economic importance of the following groups of rocks: Cuddapahs, Kaladgi, Vindhyans and Bhima groups. .
Palaeozoic
Gondwana Super Group - 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.
Cretaceous rocks of Tiruchirapalli- Distribution, lithology , classification, life and age limit.
Cenozoic stratigraphy of India:
a. Kutch basin,
b. Siwalik successions - Distribution, lithology, classification, life and age of Siwaliks.
c. Assam, Andaman and Arakan basins.
Stratigraphy and structure of Krishna-Godavari basin, Cauvery basin, Bombay offshore basin, Kutch and Saurashtra basins and their potential for hydrocarbon exploration. …… 3 hr.
Volcanic provinces of India
a. Deccan traps - Distribution, lithology, infra trappeans- bagh and lameta beds. Intertrappeans- Gurumatkal intertrappeans . Supratrappeans-Nummulitic limestone. Age of Deccan traps- based on fossils and other methods. Economic importance.
b. Rajmahal
c. Sylhet Trap …… 3 hr.

RECOMMENDED BOOKS
NOTE TO CANDIDATES: THE LISTED TEXTBOOKS BELOW ARE ONLY SUGGESTED READING. THE LIST DOES NOT DEFINE OR LIMIT THE SYLLABUS.

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.
5. Raup, D. M., Stanley, S. M., Freeman, W. H. (1971) Principles of Paleontology

6. Clarkson, E. N. K. (2012) Invertebrate paleontology and evolution 4th Edition by Blackwell
7. Publishing.
8. Benton, M. (2009). Vertebrate paleontology. John Wiley & Sons.
9. Shukla, A. C., & Misra, S. P. (1975). Essentials of paleobotany. Vikas Publisher
10. Armstrong, H. A., & Brasier, M.D. (2005) Microfossils. Blackwell Publishing.
11. Wadia, D., 1973. Geology of India. Mc Graw Hill Book co.
12. Ravindra Kumar, 1985. Fundamentals of Historical Geology & Stratigraphy of India. Wiley Eastern.
13. Shrock, R.R. & Twenhoffel, W.H., 1952. Principles of Invertebrate Paleontology. CBS Publ.
14. Swinerton, HH., 1961. Outlines of Paleontology. Edward Arnold Publishers
15. Jain, P.C. & Anantharaman, M.S., 1983. Paleontology: Evolution & Animal Distribution. Vishal Publ.
16. Lehmann, U., and Hillmer 1983. Fossil Invertebrate. Cambridge Univ. Press.
17. Rastogi, 1988. Organic evolution. Kedrnath and Ramnath Publ.
18. Moore, Lalicker and Higher: - Invertebreate Palaeontology
19. Remer : - Invertebrate Palaeontology
20. Arnold: - Introduction to Palaeontology
21. Glaessner: - Principles of Micropalaeontology
22. Mem.GeoI.Soc.India Geology of Karnataka
23. GSI Publication Geology of Karnataka.
24. Mem. Geol. Soc of India Deccan Basalts
25. Henry Woods - Invertebrate paleontology - Cambridge press
26. Romer. A.S - Vertebrate paleontology, Chicago press.
27. Arnold. C.A - An introduction to paleobotany, MC-Graw-Hill
28. B.U.Hag and A. Boersma (1978) Introduction to Marine Micropaleontology, Elsevier, Netherlands
29. Ramp. D.M. and Stanely.M.S - Principles of Paleontology
30. Moore.R.C. Laliker C.G & Fishcher.A.G – CBS Publishers InvertebrateFossils, Horper brothers
31. The Elements of Palaeontology Rhona M.Black Cambridge University press.

IV SEMESTER B.Sc. DEGREE PROGRAMME
GEOLOGY
PRACTICAL-IV

Total Teaching Hours: 64 **LTP/Credits: 001/2**
Teaching Hours/Week: 4 **Total Marks: 50**
Exam. Duration: 3 Hrs.
(C_1 Assignment -5 mark: C_2 Seminar -5 mark: C_3 Main Exam-40 mark)

1. Study of fossils showing various modes of preservation **1 Pra**.
2. **Study of diagnostic morphological characters, systematic position, stratigraphic position and age of the following invertebrate, micro and plant fossils. 7 Pra**

(Description with neat diagrams and labelling the parts are compulsory)

Corals: Calceola, zapherentis , lithostrotion, favosites, halysites.

Brachiopoda: Spirifer, producters, terebratula, rhynconella, atrypa.

Pelecypoda: Cardita, pectin, trigonia, gryphea, hippurites.

Gastropoda: Natica, turritella, cerithium. conus, voluta, physa.

Cephalopoda: Nautiloids (Nautilus, Orthoceras) and Ammonoids (goniatites, ceratites, acanthoceras, hamites.

Trilobita: Paradoxide, calamene, phacops, trinucleus.

3. **Plant fossils**: Glassopteris, gangamopteris, ptillophyllum, lepidodendron, sigillaria and

calamites. **1 Pra.**

4. **Identification of Micro fossils:** Foraminifera: Lagena, Nodosaria, Textularia, Globogerina, Dentilina

1 Pra.

Techniques of separation of microfossils from the sediments.

5. **Surveying**: Chain, Compass and Plane Table and Dumpy **4 Pra**.

6. **Preparation of maps** showing distribution of important metallic and non-metallic deposits (Iron, Gold, Copper, Bauxite, Mica) and important coal and oil fields of India. **2 Pra.**

MODEL QUESTION PAPER FOR C_3

II B.Sc., IV Semester Examination

GEOLOGY

Paper: PALAEONTOLOGY AND STRATIGRAPHY

Time: 3 Hour Max. Marks: 80

SECTION : A

Answer any FIVE questions 5 X 2 = 10 Mark

1.
2.
3.
4.
5.
6.

SECTION : B

Answer any SIX questions 6 X 5 = 30 Mark

7.
8.
9.
10.
11.
12.
13.
14.

SECTION : C

Answer any FOUR questions 4 X10 = 40 Mark

15.
16.
17.
18.
19.
20.

MODEL QUESTION PAPER

II B.Sc., IV Semester Examination

GEOLOGY

PRACTICAL-4

Time: 3 Hour Max. Marks:40

1. Explain briefly about the mode of fossilization of the given model. **1 X 3 = 3 mark**
2. Identify and describe with a neat diagram the macrofossils kept (each one from Corals, Brachiopoda, Pelecypoda, Gastropoda, Cephalopoda and Trilobita) in tray from 2 to 7. **6 X 3 = 18 Mark**
3. Identify and describe the given microfossil kept in tray No. 8. **1 x 3 = 3 Mark**
4. Identify and describe with a neat diagram the plant fossil kept in tray No. 9 1 X 3= 3 Mark
5. Plane table/Compass survey 1x 5 = 5 Mark
6. Show the distribution of a mineral resource on a given map. 1 X 3 = 3 Mark
7. Lab. Record 5mark