

SHIVAJI UNIVERSITY, KOLHAPUR.



**“A” Re-accredited By NAAC
(2014) with CGPA-3.16**

Revised Syllabus For

Bachelor of Science

Geology (Part III)

(Subject to the modifications to be made from time to time)

Syllabus to be implemented from June 2015, onwards.

Shivaji University, Kolhapur

Revised Syllabus For Bachelor of Science

1. TITLE : Subject **GEOLOGY**
Optional under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- Revised Syllabus will be implemented from June 2015 onwards.

3. PREAMBLE:-

This syllabus of degree course includes foundation, core and applied components of the geology course. The student should get into the prime objectives and expected level of study with required outcome in terms of basic and advance knowledge at examination level.

4. GENERAL OBJECTIVES OF THE COURSE :

(as applicable to the Degree /Subject- Paper concerned)

- 1) To impart basic knowledge in geology
- 2) To develop awareness in the fields of mineral resources, ground water, petroleum
- 3) Introduction to the concepts of Geotectonics
- 4) Fundamental concepts of Origin and Age of Earth
- 5) Study of natural disasters and mitigation measures thereof
- 6) Study of environmental aspects in relation to geology
- 7) Understanding the earth through Remote Sensing
- 8) Understanding the concept of Geological time and geological history of the earth
- 9) Understanding the Evolutionary trends through geological time
- 10) To study the geology and tectonics of the Indian Subcontinent
- 11) To impart basic field training in geology

5. DURATION

- The course shall be a full time course.

6. PATTERN:-

Pattern of Examination will be Semester pattern for Theory papers.. Practical Examination will be on yearly Pattern.

7. **ELIGIBILITY FOR ADMISSION :-**

As per eligibility criteria prescribed for each course and the merit list in the qualifying examination.

8. **MEDIUM OF INSTRUCTION :**

The medium of instruction shall be English.

9. **STRUCTURE OF COURSE- -----**

FIRST YEAR Geology Semester I and II (NO.OF PAPERS 4)

Sr.No.	Subjects	Marks
1.	Paper I - General Geology	40
2.	Paper II - Mineralogy and Crystallography	40
3.	Paper III – Physical Geology	40
4.	Paper IV - Petrology	40
	Practicals	50
	Home Assignments , one for each Paper (Total 4 of 10 marks each)	40
	TOTAL MARKS	250

SECOND YEAR Geology Semester III and IV (NO.OF PAPERS-4)

Sr.No.	Subjects	Marks
1.	Paper V - Mineralogy and Optics	40
2.	PaperVI - Igneous Petrology	40
3.	Paper VII – Structural Geology, Photogeology and Hydrogeology	40
4.	Paper VIII – Sedimentary and Metamorphic Petrology	40
	Practicals	100
	Tests, one for each paper (total 4 of 10 marks each)	40
	TOTAL MARKS	300

THIRD YEAR Geology Semester V and VI (NO.OF PAPERS- 8)

Semester V

Sr.No.	Subjects	Marks
1.	Paper IX - Dynamics of Earth	40
2.	Paper X : Stratigraphy and Palaeontology	40
3.	Paper XI: Economic Geology	40
4.	Paper XII: Geomorphology and Remote Sensing	40
	Project/ Seminar / Tutorial for each Paper (Total 4 of 10 marks each)	40
	TOTAL MARKS	200

Semester VI

Sr.No.	Subjects	Marks
1.	Paper XIII – Proterozoic Stratigraphy of India	40
2.	Paper XIV – Phanerozoic Stratigraphy of India	40
3.	Paper XV – Prospecting and Mineral Exploration	40
4.	Paper XVI – Environmental Geology and Hydrogeology	40
	Project/ Seminar / Tutorial for each Paper (Total 4 of 10 marks each)	40
	Practicals	200
	TOTAL MARKS	400

10: NATURE OF QUESTION PAPER COMMON MENTIONED SEPARATELY:

11. SCHEME OF TEACHING:-

THIRD YEAR Geology (B.Sc. Part III)

Semester V

Scheme of Teaching and Examination

Sr. No.	Subject/Paper	Teaching Scheme (Hrs/Week)			
		L	T	P	Total
1	Paper IX - Dynamics of Earth	3	--	5	8
2	Paper X: Stratigraphy and Palaeontology	3	--	5	8
3	Paper XI: Economic Geology	3	--	5	8
4	Paper XII: Geomorphology and Remote Sensing	3	--	5	8
	Total= 4 (Four)	12	--	20	32

Semester VI

Scheme of Teaching and Examination

Sr. No.	Subject/Paper	Teaching Scheme (Hrs/Week)			
		L	T	P	Total
1	Paper XIII - Proterozoic Stratigraphy of India	3	--	5	8
2	Paper XIV: Phanerozoic Stratigraphy of India	3	--	5	8
3	Paper XV: Prospecting and Mineral Exploration	3	--	5	8
4	Paper XVI: Environmental Geology and Hydrogeology	3	--	5	8
	Total= 4 (Four)	12	--	20	32

13. SCHEME OF EXAMINATION :-

- Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

14. **STANDARD OF PASSING:-**

As Prescribed under rules & regulation for each degree/programme of Shivaji University, Kolhapur.

15. **EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS)**

Equivalence of new syllabus given to old syllabus.

Old Syllabus

Paper IX - Dynamics of Earth,

Paper X - Stratigraphy and Palaeontology.

Paper XI – Processes of Formation of Mineral Deposits.

Paper XII- Remote Sensing and Geomorphology.
Paper XIII- Precambrian Stratigraphy of India
Paper XIV- Phanerozoic stratigraphy of India.
Paper XV- Prospecting and Mineral Exploration
Paper XVI- Environmental Geology and Hydrogeology

New Syllabus

Paper IX - Dynamics of Earth,
Paper X - Stratigraphy and Palaeontology.
Paper XI – Processes of Formation of Mineral Deposits.
Paper XII- Remote Sensing and Geomorphology.
Paper XIII- Precambrian Stratigraphy of India
Paper XIV- Phanerozoic stratigraphy of India.
Paper XV- Prospecting and Mineral Exploration
Paper XVI- Environmental Geology and Hydrogeology

B.Sc. Part III Geology (Introduced from June 2015 onwards)

Paper – IX

Dynamics of Earth

Unit I - Crustal movements: Orogenic and Epirogenic movements. Types of Mountains and their Origin: Volcanic, Tectonic, and Denudational
(10 Periods)

Unit II - Concept of geosynclines; Cratons, Mobile Belts, Rift Zones; Continental Drift
(10 Periods)

Unit III - Plate tectonics- Concept, Characteristics of plates, Plate boundaries- Divergent, Convergent, Transform faults ; Sea-floor spreading; Palaeomagnetism; Polar Wandering
(10 Periods)

Unit IV - Plate motion and causes; Hot plumes and Hotspots; triple junctions; Tectonic Framework of India
(10 Periods)

Reference Books:

1. The Dynamic Earth System - A.M. Patwardhan.
2. Principles of Physical Geology - A. Holmes (English Language Book Society)
3. General Geology- V.Radhakrishna.
4. Aspects of Tectonics - K.S. Valdiya (Universities Press, Hyderabad)
5. Geology of India Volume 1 (Geological Society of India, Bangalore)

Paper – X

Title of Paper: Stratigraphy and Paleontology

Unit I - Stratigraphy- Introduction, Definition and Scope; Principles of Stratigraphy; Standard Stratigraphic Scale (Geological Time Scale); Stratigraphic units- Litho-stratigraphic, Bio- stratigraphic, Chrono-stratigraphic

(10 Periods)

Unit II - Facies concept in Stratigraphy – Lithofacies and Biofacies ; Methods of Stratigraphic Correlation.

Paleontology- Fossils; conditions of fossilization; Modes of preservation of fossils

(10 Periods)

Unit III - Uses of fossils; Index Fossils; Introduction to Microfossils and its significance in Petroleum Exploration.

Morphology, classification, geological and Geographical distribution of following groups-

- a. Phylum – Arthropoda
- b. Phylum Coelenterata _ (Anthozoa)

(10 Periods)

Unit IV - Morphology, classification, geological and geographical distribution of following

groups- a. Phylum – Mollusca (Lamellbranch, Gastropods, Cephalopods)

- b. Phylum- Brachiopoda
- c. Phylum – Echinodermata

(10 Periods)

ReferenceBooks:

1. Stratigraphy and Sedimentation - W.C. Krumbein and L.L. Sloss
(W. H.Freeman and Company)
2. Stratigraphic Principles and Practice - J. M. Weller (Universal Book Stall)
3. Essentials of Earth History - W. L. Stokes (Prentice-Hall of India (Pvt.) Ltd.)
4. Outlines of Paleontology – H. H.Swinnerton. (Edward Arnold and Company)
5. Fundamentals of Invertebrate Palaeontology – M. A. Koregave.
(Book World Enterprise, Mumbai)
6. Invertebrate Palaeontolgy - H. Woods (CBS Publishers and Distributors)
7. Fundamentals of Micropalaeontology - M. A. Koregave

Paper XI

Title of the paper- Economic Geology

Unit I - Materials of Metalliferous and non-Metalliferous deposits.

Processes of formation of mineral deposits - Magmatic Concentration
Sublimation, Evaporation

(10 Periods)

Unit II - Processes of formation of mineral deposits - Contact Metasomatism,
Hydrothermal processes

(10 Periods)

Unit III - Processes of formation of mineral deposits - Oxidation and Supergene
enrichment, Residual and Mechanical concentration.

(10 Periods)

Unit IV - Formation of Hydrocarbon deposits (Petroleum and Coal)

(10 Periods)

Reference Books :

1. Economic mineral deposits- Jenson and A. M. Bateman (Willey and Sons)
2. An introduction to Mineral Economics - K. K.Chatterjee (Willey Eastern Ltd.)
3. Geology of Petroleum - A. I. Lavorsen (CBS Publishers and Distributors)
4. Coal Geology
5. Industrial minerals of India- A..K..Dev
- 6.Ore deposits J.Parks

Paper XII

Geomorphology and Remote Sensing

Unit I - Geomorphology - Introduction , Ten concepts of geomorphology;
Relationship between landforms and underlying rocks ; Slope- geometric
properties and classification; Soil - definition, Soil texture, structure and
composition; Soil profiles and horizons; soil formation- processes and factors

(10 Periods)

Unit II - Cycle of Erosion - Cyclic concept, Geomorphic erosion cycle of W.M.
Devis, Pencks and C.L. King ; Rejuvenation due to eustatic and landscape
evolution ;Topographic evidences of rejuvenation ; Morphometric
parameters.

(10 Periods)

Unit III- Remote Sensing - Definition, Concept of remote sensing – Source of
Electromagnetic energy, Electromagnetic spectrum; Indian Scenario;
Sensors- Camera, film, Linear and multi spectral scanner.

(10 Periods)

Unit IV - Imagery – IRS products (Main). MSS Bands- blue, green, red and near
I.R. – FCC.
Importance in Geology - Lineaments, fractures, faults, folds, dykes, Unconformities;
Igneous, sedimentary and metamorphic terrain identification.

(10 Periods)

Reference Books :

1. Geomorphology – Savinder Singh (Prayag Pustak Bhawan , Allahabad)
2. Principles of Geomorphology – W. D.Thornbury (John Wiley and Sons)
3. Geomorphology – A. L. Bloom
- 4 Environmental Geology – E. A. Keller (CBS Publishers and Distributors)
5. Remote Sensing and Image Interpretation - T.M. Lillesand and R.W. Kiefer
(John Wiley and Sons)
6. Remote Sensing - Principles and Image Interpretation - F.F. Sabins
(W.H. Freeman and Company)
7. Principles of Remote Sensing - P.J. Curran (ELBS)
8. Textbook of Remote Sensing and Geographical Information Systems 3rd
Edition
- M. Anji Reddy (B.S. Publications)

PAPER XIII

Title Of Paper: Proterozoic Stratigraphy of India

Unit I – Dharwar Craton – Geographic distribution, classification, structure and economic importance of Sargur Group, Peninsular Gneiss, Dharwar Supergroup

Bastar Craton – Geographic distribution, classification, structure and economic importance of Sukma and Amgaon Gneissic Complex, Bhopalpatnam and Kondagaon Granulite Belts, Sakoli Fold Belt

(10 periods)

Unit II - Singhbhum Craton- Geographic distribution, classification, structure and economic importance of Iron Ore Sequences

Aravalli Craton – Geographic distribution, classification, structure and economic importance of Bhilwara Supergroup, Aravalli Fold Belt, Delhi Fold Belt, Malani Igneous suite

(10 Periods)

Unit III – Eastern Ghats Mobile Belt- Geographic distribution, classification, structure and economic importance of Khondalites and Charnockites

Satpura Mobile Belt – Geographic distribution, classification, structure and economic importance of Sauser Supracrustal Belt

(10 Periods)

Unit IV- Proterozoic Sedimentary Basins - Geographic distribution, classification, structure and economic importance of Vindhyan Supergroup, Cuddapah Supergroup and Bagalkot Basin

(10 Periods)

ReferenceBooks:

1. Geology of India Volume I (Geological Society of India)
(Wily Eastern Limited, New Delhi)
2. Stratigraphy of India and Burma - M. S. Krishnan.
(CBS Publishers and Distributors)
3. Geology of Karnataka - B. P. Radhakrishna (GSI Publications, Bangalore)
5. Geology of Rajasthan - (GSI Publications, Bangalore)
6. Singhbhum-Orissa Iron-ore Craton - Sinha Roy (GSI Publications, Bangalore)

Paper XV – Prospecting and Mineral Exploration

Unit I - Meaning of Prospecting ; Principle involved - Background value, threshold , Anomaly ; Description of various methods of prospecting - Geological methods , Geochemical methods and Geobotanical methods -Principle , instruments, field procedures, interpretation and applications.

(10 Periods)

Unit II - Description of the following geophysical methods

- a. Electrical method - i. Self Potential method
ii. Resistivity method - Wenner and Schlumberger array
- b. Magnetic method - Aeromagnetic
- c. Seismic method - i. Refraction ii. Reflection
- d. Gravity method
- e. Radioametric method
- f. Remote sensing method - i. Aerial photographs ii. Satellite imageries

(10 Periods)

Unit III - Mineral Exploration; Sampling methods –Random sampling, Grab sampling, Coning and Quartering, Pitting , Trenching , Drilling – Drilling for Alluvial Prospecting; Petroleum Exploration; Groundwater Exploration; Hardrock Drilling, Assaying ;

(10 Periods)

Unit IV - Mining Terminology –Winning, Shaft, Hanging Wall, Adit, Drift, Level, Cross cut, Tunnel, Raise, Winze, Ore Basin, Chute, Stope, Air Crossing;
A outline of Alluvial Mining,Open Cast Mining or Quarrying and Underground Mining;
Conservation of Mineral Resources ;

(10 Periods)

Reference Books

- 1.. Geophysical Prospecting – M. B. Dobrin (McGraw Hill Publication)
- 2.. Geochemistry in Mineral Exploration – H. E. Hawkes and J. S. Webb.
(Harper International Student Reprint)
3. Field Geology - F. H. Lahee (CBS Publishers and Distributors)
4. Courses in Mining Geology – R.N.P Arogyaswamy (Oxford and IBH Publishing Co.)
5. Mining geology – H. E. Mckinstry (Prentice-Hall inc.)

Paper XVI – Environmental Geology and Hydrogeology

Unit I - Meaning of Environment ; Environmental Geology - definition , scope, fundamental concepts in environmental geology ; Natural Hazards - Floods , Earthquakes and Tsunamis ,Mass movements (Fall , Slide , Flow , Creep)
(10 periods)

Unit II – Natural Hazards- Volcanic Activity, Coastal Hazards
Man-made hazards related to Mining activity, Over exploitation of surface water and Groundwater and Oil spills.
(10 Periods)

Unit III - Hydrogeology – Movement of Groudwater – Darcy’s Law; Watershed and Watershed Management ; National Water Policy,
(10 Periods)

Unit IV - Rain Water Harvesting techniques - Traditional and Modern methods of rainwater harvesting ; Budgeting of water
(10 Periods)

Reference books:

1. Principles of Physical Geology- A. Holmes. (ELBS)
2. Environmental Geology - K. S. Valdiya
3. Environmental Geography - Savinder Singh (Prayag Pustak Bhawan , Allahabad)
4. Groundwater Hydrology- D. K. Todd (John Wiley and Sons)

Practical Course Geology

Unit- I: Mineralogy (Microscopic) and Industrial and ore minerals (Megascopic)

i) Mineralogy (Microscopic) - Olivine, Hypersthene, Enstatite, Augite, Diopside, Actinolite, Tremolite, Hornblende, Muscovite, Biotite, Orthoclase, Microcline, Sanidine, Plagioclase, Leucite, Nepheline, Quartz, Tourmaline, Calcite, Staurolite, Garnet, Kyanite, Sillimanite, Andalusite, Sphene, Epidote, Chlorite.

ii) Ores and Industrial minerals (Megascopic)

Ores: Pyrolusite, Psilomelane, Rhodocrosite, Hematite, Magnetite, Pyrite, Limonite, Goethite, Chalcopyrite, Native-copper, Braunite, Malachite, Azurite, Galena, Sphalerite, Chromite, Illemanite, Cinnabar, Realgar, Orpiment, Wolframite, Bauxite, Stibnite.

Industrial minerals: Quartz, Beryl, Barite, Asbestos, Mica, Calcite, Gypsum, Magnesite, Kaolin, Corundum, Zeolite, Kyanite, Sillimanite, Andalusite, Garnet, Graphite, Zircon, Feldspar, Talc, Sulphur, Fluorite, Dolomite, Olivine.

Unit – II: Optics, Mineral calculations and Paleontology

i) Optics:

1. Types and determination of extinction for Hornblende and Augite, Diopside, Tremolite.
2. Determination of sign of elongation of Sillimanite, Actinolite, Staurolite, Biotite and Tourmaline.
3. Study of interference figure of uniaxial minerals and their optic sign- Quartz, and Calcite.

ii) Mineral calculations:

- i) Determination of type of pyroxene with the help of Hess method and diagram from a given chemical data.
- ii) Determination of type of plagioclase feldspar from a given chemical data.

iii) Palaeontology

Identification and description of the following Invertebrate fossils:

1. Phylum – Coelentrata – Favosite, Tubipora.
2. Phylum – Mollusca,
Class- Lamellibranchia – Graphea, Pecten, Cardium, Trigonina, Inoceramus and Cardita.
Class – Gastropoda - Voluta, Conus, Physa, Turritella, Trochus, Turbo, Cypraea.
Class – Cephalopoda – Nautilus, Goniatites, Acanthoceras, Belemnites.
3. Phylum – Brachiopoda – Productus, Lingula, Terebratulina, Rhyconella, Spirifer.
4. Phylum – Echinodermata – Echinus, Holaster, Hemiaster, Micraster.
5. Phylum – Arthropoda – Trilobites, Paradoxide, Trinucleus and Ogygia.
6. Identification and description of the following plant fossils – Calamites, Lepidomelane, Siggilaria, Vertibraria, Lepidomelane, Glossopteris, Gangamopteris, Neuropteris, Nissonia and Ptilophyllum

Unit- III Study of rocks.

Megascope Identification:

1. Igneous rocks: Granites and its varieties, Pegmatite, Obsidian, Pumice, Rhyolite, Granodiorite, Diorite, Andesite, Pitchstone, Syenite porphyry, Trachyte, Gabbro, Dolerite, Basalts and its varieties, Dunite, Lamprophyre, Felsite, Norite, Peridotite, Anorthosite.
2. Secondary and sedimentary rocks: Laterite, bauxite, Breccia, Conglomerate, Grit, Arkose, Siliceous sandstone, Ferruginous sandstone, Flagstone, Shale, Mudstone, Limestone, Oolitic limestone, Shelly limestone.
3. Metamorphic rocks: Slate, Phyllite, Sericite schist, Chlorite schist, Mica schist, Mica garnet schist, Kyanite schist, Graphite schist, Hornblende schist, Actinolite schist, Tremolite schist, Amphibolite, Fuschite quartzite, Hematite quartzite, Marble, Schorl, Granite gneiss, Garnetiferous gneiss, Augen gneiss, Hornblende gneiss, Charnockite.

Microscopic Identification

1. Igneous rocks: Granite, Dolerite, Gabbro, Basalt, Dunite, Anorthosite, Peridotite, Lamprophyre, Syenite, Trachyte, Diorite, Andesite, and Norite.
2. Sedimentary rocks: Sandstone, Ferruginous sandstone, Arkose, Limestone, Shelly limestone, Oolitic Limestone.
3. Metamorphic rocks: Chlorite schist, Mica schist, Mica garnet schist, Sillimanite schist, Kyanite schist, Charnockite, Quartzite, Amphibolite, Hornblende gneiss, Granite gneiss, Augen gneiss.

II) Origin and description of the following structures and textures

Megascope Identification (Textures and Structures)

1. Igneous rocks: Granitic, Porphyritic, Glassy, Vesicular, Amygdaloidal, Flow, Ropy, Graphic, Columnar.
2. Sedimentary rocks: Clastic, Lamination, Graded bedding, cross bedding, Ripple marks, Mudcracks, Pisolitic, Oolitic.
3. Metamorphic rocks: Slaty cleavage, Schistose, Granulose, Gneissose, Augen and Cataclasite.

Microscopic Identification (Textures)

1. Igneous rocks: Granitic, Porphyritic, Ophitic, Subophitic, Graphic, Intergranular, Intersertal, Flow, Reaction rim, and corona.
2. Sedimentary rocks: Clastic, Oolitic.
3. Metamorphic rocks: Slaty cleavage, Schistose, Granulose, Gneissose, and Augen.

Unit IV: Petrochemical calculations and computer applications.

A) Petrochemical calculations – from given chemical analysis of rocks.

1. Determination of CIPW Norms (Over saturated rocks) and classification.
2. Determination of Niggli values up to quartz values and classification.
3. Determination of ACF and plotting on triangular diagrams for metamorphic rocks.
4. Plotting of sedimentological size analysis data on histogram and frequency curves, mode and mean, Folk and Ward's (1957) graphic measures-mean, size and standard deviation. Significance of this analysis to be compared with std. Table given by Krumbein and Sloss.

B) Computer applications:

1. Introduction to fundamental statistical applications to geology – Viz- Mean, Mode, Median and standard deviation and variance.
2. Computer fundamentals- Information technology, Hardware concepts, Classification of computers and computer soft wares, Introduction to DOS (Disc operating system) and DOS commands.

Introduction to problem solving, flow chart, branching and looping.
3. Windows (Software programme)- Introduction to windows Operating system, working with windows excel, solving petrochemical calculations and geomorphic analysis, Preparation of histograms, Line, Bar, Pie charts.

Unit V: Geomorphology, Toposheet reading, Drainage analysis and remote sensing techniques. Reading of Toposheet

1. Identification of features from Toposheets: Mesa, Butte, Ridge, Cuesta, Meander, Incised meander, Point bar.
2. Drainage patterns, drainage density and its significance.
 - i) Drainage basin analysis- stream order, (Strahler's method), Stream number, Stream length, Basin area, Basin area ratio, Drainage density and Bifurcation ratio and their significance.
3. Terrain features identifications:
 - a) Drainage – Drainage pattern, density and its significance.
 - b) Landforms – Mesa, Butte, Ridge and Cuesta.
 - c) Lineaments – Stream (Tonal contrast and Topographic contrast).
 - d) Structures – Tectonic features.

Unit VI: Structural maps and problems:

- 1) Completion of Outcrops (Single inclined series) and one fault and intrusion.
- 2) Drawing of geological sections and geological history of the given maps.
- 3) Solving borehole problems by graphical methods and also on contour maps.

Fieldwork: Geological fieldwork in selected areas as specified in paper VII- Indian Stratigraphy, for about 15 days under guidance is compulsory. Submission of fieldwork report along with specimens collected is also compulsory.

Field project: Related to geology like Well inventory, Resistivity survey in the area or any other work related to geology.

- + During each practical writing of laboratory journal is compulsory and it is to be checked by teacher in-charge and certified by the Head of the Department.

Nature of theory question paper and practical examination and scheme of marking.

Theory papers:

There will be 4 theory papers with total 160 marks, each paper for 40 marks in each semester. Total theory papers will be 8 in two semesters.

Nature of each theory question paper

- | | |
|---|---------------|
| 1. Objective type question | 8 marks. |
| 2. Full two questions out of given three, | 8 marks each. |
| 3. Short answer type question (four out of six) | 16 marks. |

Practical:

Practical examination will consist of total 200 marks and the examination will be conducted on 3 days, covering two units of practical each day as follows:

Practical examination of 3 days for total 200 marks as given below:-

Part I: Unit –I and Unit II (First day)

Section I

Mineralogy Microscopic	8 marks.
Megascopic	12 marks.

Section II

Optics	8 marks
Palaeontology	10 marks
Mineral calculation- Hess	6 marks
Plagioclase	6 marks.
	Total 50 marks

Part II: Unit III and IV (Second day)

Section I

Study of rocks Microscopic	6 marks.
Study of rocks Megascopic	9 marks.

Section II

Structure/Texture Microscopic	6 marks.
Megascopic	9 marks.

Section III

Petrochemical calculations and Computer applications	
Norm	6 marks.
Niggli	4 marks.
ACF	4 marks.
Size Analysis	6 marks.
	Total 50 marks

Part III: Unit – V and VI (Third day)

Section I

Toposheet reading	4 marks.
Remote sensing	10 marks.
Drainage analysis	8 marks.

Section II

Outcrop			8 marks.
Map section			10
marks.		Graphical	problem
5	marks.	Contour	problem
5 marks.			
			Total 50 marks

Section III

Journal		20 marks	Project
report/Fieldwork report		20 marks	Viva
voce		10 marks.	
		Total	50 marks

C] OTHER FEATURES :

1. INTAKE CAPACITY / NUMBER OF STUDENTS:-
As per University Norms

2. TEACHERS QUALIFICATIONS:-

- As prescribed by norms .
- Work load details should be as per Apex body/UGC/State Govt./University norms.

(A) LIBRARY :

----- List of books has been mentioned paper wise in the syllabi.

(B) SPECIFIC EQUIPMENTS : Necessary to run the Course.

Rocks and minerals specimens, fossil specimens, petrological microscopes, field equipments, maps, charts, models, Aerial photographs, satellite imageries, stereoscopes, slide projector, OHP/LCD, Computers and necessary softwares and operating systems etc.

(C) LABORATORY SAFETY Measures:

General Safety Rules For Laboratory Work.

I. List Of Equipments Needed For Laboratory Safety

1. Fire extinguisher
2. First Aid Kit
3. Good earthing and insulated wirings for electrical supply
4. Standard operated procedure manuals for instrument, map, specimens etc.

II. Instructions For Safety In Laboratory

1. Any injury while handling rocks and mineral must be reported to teacher in charge of practically immediately.
2. In case of fire, switch off all electric connections.
3. Make your workplace clean before leaving the laboratory.
4. Know the place of fire extinguisher, first aid box.
5. Do not use cell phones in laboratory.

III. Do's

1. Always wear shoes in the laboratory.
2. Maintain separate record book for practical work.
3. Maintain silence, cleanliness and discipline in the laboratory.
4. Handle the laboratory equipment, rock, and mineral specimens carefully.
5. Follow the standard operation procedure of instrument.

IV. DON'T

1. Don't take apparatus out of laboratory.
2. Don't eat or drink any food in laboratory.
3. Don't enter or leave the laboratory without permission.

Guidelines for Field Work

1. During study tour, more emphasis be given to field relations of rocks, collection of specimens, their labeling and mapping.
2. students are advised to carry field equipments – viz. hammers, clinometers / brunton compass, magnifying lens, tape, maps / toposheets, field note books, writing and drawing material as well as haversack for collection of specimens.
3. field notes should be taken under the guidance of teacher in-charge incorporating photographs, sketches and measurement of different features.
4. Strict discipline and safety measures must be followed under the guidance of teacher in-charge.
5. Preparation of the study tour report and its presentation along with field collection at the time of practical examination is compulsory.