UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(23/July/Adp./54)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies in the subject of **Geology** of Semester **IIIrd** and **IVth** for **Four Year Under Graduate Programme (FYUGP)** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Geology	Semester- III	Dec. 2023, 2024 and 2025
	Semester-IV	May 2024, 2025 and 2026

The Syllabi of the courses is also available on the University website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/6093-6132
Dated: 6-7-2023
Copy for information and necessary action to:

1 Dean, Faculty of Science
2 Convener, Board of Studies in **Geology**
3 Sr. P.A.to the Controller of Examinations
4 All members of the Board of Studies
5 Confidential Assistant to the Controller of Examinations
6 I/C Director, Computer Centre, University of Jammu
7 Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
8 Incharge, University Website for Uploading of the notification.

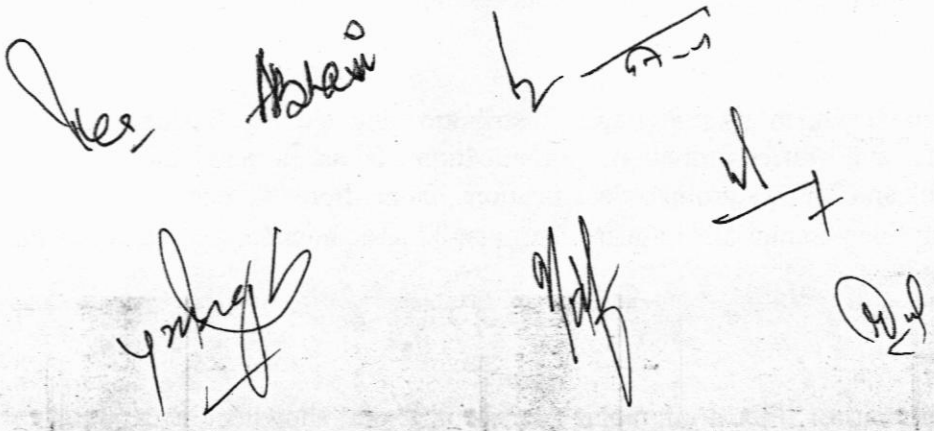
06/7/23

Deputy Registrar(Academic)

6/7/23 6/7/23

SYLLABI AND COURSES OF STUDY IN GEOLOGY AT FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP) UNDER CBCS AS PER THE NEP-2020

Sem	Course Type	Course Code	Course Title	Credits	Marks				Total Marks
					Theory		Practical/Tutorial		
—	———	———	———	———	Mid Sem	End Sem Exam	Assessment	Exam+ Viva	———
3rd	Major	UMJGET301	Descriptive Mineralogy	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
		UMJGET302	Petrology	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
	Minor	UMIGET303	Mineralogy	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
	Multidisciplinary	UMDGET304	Physical Geology	3	15 marks	60 marks	———	———	75
	SEC	USEGET305	Disaster Response, Rehabilitation & Recovery	2	10 marks	40 marks	———	———	50
4th	Major	UMJGET401	Stratigraphy	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
		UMJGET402	Palaeontology	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
		UMJGET403	Optical Mineralogy	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
		UMJGET404	Structural Geology	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100
	Minor	UMIGET405	Petrology	3Th+1P/T = 4	15 marks	60 marks	10 marks	15 marks	100



UNIVERSITY OF JAMMU

Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET401	Course Title: **Stratigraphy**
CREDITS: 03 (Theory) + 01 (Practical)	Total No. of Lectures (Theory): 45 Hours Practical: 30 Hours

Total Marks: 100
Maximum Marks Theory: 75
Maximum Marks Practical: 25

Course outcome: The course content provides the students with an over-all knowledge of the stratigraphic methods. The course content is intended to familiarize the students with the tectono-stratigraphic framework of various lithostratigraphic units of India spanning Archaean to Holocene.

UNIT 1

1.1 Definition, Principles of stratigraphy; Geological Time Scale.
1.2 Principles of stratigraphic classification, Lithostratigraphy, Chronostratigraphy and Biostratigraphy.
1.3 Stratigraphic correlation: Palaeontological and Non-Palaeontological correlation.
1.4 Physiographic divisions of India.

UNIT 2

2.1 Distribution and classification of the Archaean rocks in India.
2.2 The Dharwar Supergroup: distribution, lithology and classification.
2.3 Distribution, lithologies and classifications of the unmetamorphosed Proterozoic successions of India: The Cuddapah and the Vindhyan supergroups.
2.4 Salkhala rocks of Jammu and Kashmir, Dogra slates, Simla slates.

UNIT 3

3.1 Marine Palaeozoic sequences of Kashmir Himalaya.
3.2 Concept of Gondwanaland and global distribution of Gondwana rocks, nature and distribution of Gondwana outcrops in Peninsular and Extra-Peninsular India.
3.3 Marine Triassic succession of Spiti; Mesozoic succession of Kutch.
3.4 Marine and non-marine Cretaceous successions of Trichinopoly.

UNIT 4

4.1 Deccan volcanism: its stratigraphic distribution and age relationships.
4.2 Subathu and Murree formations: classifications, fauna, flora and age.
4.3 Siwalik and Karewa groups: classifications, fauna, flora and age.
4.4 Precambrian-Cambrian boundary; Permian-Triassic boundary; Cretaceous-Paleogene boundary.

PRACTICAL

1. Preparation of lithostratigraphic maps of India showing distribution of important geological formations.

2. Preparation of the Paleogeographic reconstruction maps showing the position of India throughout the geologic history.

NOTE FOR PAPER SETTING

Examination Theory/Practical	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1½ Hour	15 Marks
End Semester Examination	100%	3 Hours	60 Marks
Internal Practical	-	-	10 Marks (Based on daily performance only)
External Practical	-	-	(10 Marks Test & 5 Marks Viva)

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five short answer type questions of 2 marks each to be conducted after the completion of 50% syllabus from unit 1.1 to 2.2.

External End Semester Theory Examination will have two sections (A & B):

1. **Section A** shall be of ***12 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. one question from each unit. Each question shall be of **3 marks** (**All compulsory**).
2. **Section B** shall be of ***48 Marks*** and will comprise of Eight (8) long answer type questions (**Four to be attempted**), representing whole of the syllabus, i.e. two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of **12 marks**.

Books Recommended:

1. P. Doyle, and M.R. Bennett, 1996. Unlocking the Stratigraphic Record, John Willey.
2. C.O. Dunbar, and J. Rodgers, 1957. Principles of Stratigraphy, John Wiley & Sons.
3. M.S. Krishnan, 1982. Geology of India and Burma, C.B.S. Publishers, Delhi
4. S.M. Naqvi, 2005. Geology and Evolution of the Indian Plate: From Hadean to Holocene 4 Ga to 4 Ka. Capital Pub., New Delhi.
5. E.H. Pascoe, 1968. A Manual of the Geology of India & Burma (Vols.IN), Govt. of India Press, Delhi.
6. C. Pomerol, 1982. The Cenozoic Era - Tertiary and Quaternary. Ellis Harwood Ltd., Halsted Press.

7. R.M. Schoch, 1989. Stratigraphy: Principles and Methods, Van Nostrand Reinhold, New York.
8. R. Vaidyanathan & M. Ramakrishnan, 2008. Geology of India, Geological Society of India, Vol. I – II.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET402	Course Title: **Paleontology**
CREDITS: 03 (Theory) + 01 (Practical)	Total No. of Lectures (Theory): 45 Hours Practical: 30 Hours
Total Marks: 100 Maximum Marks Theory: 75 Maximum Marks Practical: 25	

Course outcome: The paleontology course is intended to enable the students to understand the morphology, evolution and extinction of life through the geologic time. The students will acquire skills of describing fossils and their taxonomic classification.

UNIT 1

1.1 Definition and types of fossils; Significance of fossils.
1.2 Conditions of fossilization and modes of preservation of fossils.
1.3 Collection and preparation of fossils; Code of systematic nomenclature of fossils.
1.4 Introduction to Ichnology; Paleontological significance of trace fossils.

UNIT 2

2.1 Morphology and geological distribution of Trilobita.
2.2 Morphology and geological distribution of Brachiopoda.
2.3 Morphology and geological distribution of Pelecypoda.
2.4 Morphology and geological distribution of Cephalopoda and Gastropoda.

UNIT 3

3.1 Morphology and geological distribution of Graptolites.
3.2 Morphology and geological distribution of Echinoidea.
3.3 Origin, diversity and extinction of Dinosaurs.
3.4 Evolutionary history of Horse.

UNIT 4

4.1 Evolutionary history of Whale.
4.2 Introduction to the human evolution.
4.3 Introduction to paleobotany; Morphology, distribution and significance of the Gondwana flora.
4.4 Introduction to micropaleontology and significance of microfossils; Brief idea of Paleobiogeography and Paleoecology.

PRACTICAL

1. Study of the morphology of representative invertebrate fossils of Mollusca (Bivalvia, Gastropoda and Cephalopoda), Brachiopoda, Echinodermata (Echinoidea) and Trilobita.
2. Study of important Gondwana plant fossils; Study of important trace fossils; Study of important vertebrate fossils.

UNIVERSITY OF JAMMU

Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET402 Course Title: **Paleontology**

NOTE FOR PAPER SETTING

Examination Theory/Practical	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1½ Hour	15 Marks
End Semester Examination	100%	3 Hours	60 Marks
Internal Practical	-	-	10 Marks (Based on daily performance only)
External Practical	-	-	(10 Marks Test & 5 Marks Viva)

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five short answer type questions of 2 marks each to be conducted after the completion of 50% syllabus from unit 1.1 to 2.2.

External End Semester Theory Examination will have two sections (A & B):

1. **Section A** shall be of ***12 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. one question from each unit. Each question shall be of **3 marks** (**All compulsory**).
2. **Section B** shall be of ***48 Marks*** and will comprise of Eight (8) long answer type questions (**Four to be attempted**), representing whole of the syllabus, i.e. two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of **12 marks**.

Books Recommended:

1. R. Cowen, 2000. History of Life, Blackwell Science.
2. E.K. Clarkson, 2013. Invertebrate palaeontology and Evolution, Blackwell Science.
3. R.M. Black, 1989. The Elements of Palaeontology, Cambridge University Press.
4. Benton, 2005. Vertebrate Palaeontology, Blackwell Publishing.
5. P.W. Jackson, 2019. Introducing Palaeontology: A Guide to Ancient Life, Dunedin Academic Press Ltd.
6. R. Enay, 2012. Palaeontology of Invertebrates, Springer-Verlag.
7. M. Davies, 2008. An Introduction to Palaeontology, Read Books.
8. S. Jain, 2017, Fundamentals of Invertebrate Palaeontology: Macrofossils, Springer India.
9. S. Jain, 2017. Fundamentals of Invertebrate Palaeontology: Microfossils, Springer India.

10. P.K. Saraswati and M.S. Srinivasan, 2016. Micropaleontology: Principles and Applications, Springer International Publishing Switzerland.
11. M. Benton and A.T.H. David, 2009. Introduction to Paleobiology and the Fossil Record, Wiley-Blackwell.
12. E.H. Colbert and E.C. Minkoff, 2001. Evolution of vertebrates, Wiley Liss.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET403	Course Title: **Optical Mineralogy**
CREDITS: 03 (Theory) + 01 (Practical)	Total No. of Lectures (Theory): 45 Hours Practical: 30 Hours
Total Marks: 100 Maximum Marks Theory: 75 Maximum Marks Practical: 25	

Course outcome: This course acquaints students about the optical properties of minerals used for their identification. The students will get familiarized with the parts and functioning of polarising microscope.

UNIT 1

1.1 Elements of optics: Nature of light, electromagnetic spectrum, total internal reflection and critical angle, wave and wave front.
1.2 Ordinary and Polarized light; Methods to obtaining plane polarized light.
1.3 Phase difference, retardation, interference of light.
1.4 Reflection, Refraction, Isotropism and Anisotropism.

UNIT 2

2.1 Refractive Index; Critical angle and Total Internal Reflection.
2.2 Determination of refractive index using Becke line, oblique illumination and wave length dispersion methods.
2.3 Polarising microscope: construction and working.
2.4 Rotational method for the polarising microscope: Universal stage; nomenclature of axes of rotation.

UNIT 3

3.1 Extinction: Definition and its categories; measurement of extinction angle.
3.2 Isotropic Indicatrix; Distinguishing Between isotropic and anisotropic minerals.
3.3 Uniaxial and biaxial indicatrix and their principal sections.
3.4 Pleochroism and determination of pleochroic schemes for uniaxial and biaxial minerals.

UNIT 4

4.1 Birefringence and Interference colors.
4.2 Nature of X-ray; generation and spectra of X-rays; Bragg's Law.
4.3 X-ray diffraction: single crystal (stationary and moving) method and powder method.
4.4 Techniques for the preparation of thin sections of minerals.

PRACTICAL

1. Study of optical properties of the following minerals: Quartz, albite, microcline, orthoclase, muscovite, biotite, tourmaline, hornblende, augite, olivine, epidote, garnet.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET403 Course Title: **Optical Mineralogy**

NOTE FOR PAPER SETTING

Examination Theory/Practical	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1½ Hour	15 Marks
End Semester Examination	100%	3 Hours	60 Marks
Internal Practical	-	-	10 Marks (Based on daily performance only)
External Practical	-	-	(10 Marks Test & 5 Marks Viva)

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five short answer type questions of 2 marks each to be conducted after the completion of 50% syllabus from unit 1.1 to 2.2.

External End Semester Theory Examination will have two sections (A & B):

1. **Section A** shall be of ***12 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. one question from each unit. Each question shall be of **3 marks** (**All compulsory**).
2. **Section B** shall be of ***48 Marks*** and will comprise of Eight (8) long answer type questions (**Four to be attempted**), representing whole of the syllabus, i.e. two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of **12 marks**.

Books Recommended:

1. William D. Nesse, 2012. Introduction to optical mineralogy, Oxford University Press.
2. C. Klein and B. Dutrow, 2007. Manual of Mineral Science (23rd Ed), Wiley Publication.
3. D. Perkins, 2013. Mineralogy (3rd Ed), Pearson New International Edition.
4. H. H. Read, 1970. Rutley's Elements of Mineralogy (26th Ed), Thomas Murby & Co.
5. E.G. Ehlers, 1987. Optical Mineralogy: Theory and techniques, Wiley-Blackwell.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET404	Course Title: **Structural Geology**
CREDITS: 03 (Theory) + 01 (Practical)	Total No. of Lectures (Theory): 45 Hours Practical: 30 Hours
Total Marks: 100 Maximum Marks Theory: 75 Maximum Marks Practical: 25	

Course outcome: The course content is intended to familiarize students with the behavior of rocks under stress and strain. After the completion of the course, the students will be able to interpret geologic structures to unravel the history of deformation in rocks.

UNIT 1

1.1 Classification of geologic structures, methodology and significance of structural geology.
1.2 The direction system; attitude of planar and linear structures; bearing and back bearing.
1.3 Structure and topography, effects of topography on structural features; important representative factors of the structural maps.
1.4 Introduction to deformation and its components; homogenous and heterogenous deformation; modes of deformation and factors controlling deformation of rocks.

UNIT 2

2.1 Fundamentals of stress and strain in rocks.
2.2 Folds and folding: definition, parts of a fold and styles of a fold.
2.3 Geometric and genetic classification of folds.
2.4 Mechanics of folding: active folding (buckling), passive folding, bending, flexural slip and flexural flow.

UNIT 3

3.1 Recognition of folds in the field; Boundin structures: geometry and types.
3.2 Faults and faulting: definition, geometry and separation of a fault.
3.3 Different classification schemes of faults.
3.4 Mechanism of faulting; recognition of faults in the field.

UNIT 4

4.1 Joints: definition, classification and geologic significance.
4.2 Rock fabric: Foliation and Lineation – terminology, types and their geologic significance.
4.3 Unconformities: Definition, types and recognition in the field
4.4 Vertical and horizontal movements: horst, graben, window, klippe and nappe; Importance of Wayup (Geopetal) structures.

PRACTICAL

1. Use of Clinometer, Brunton Compass.
2. Identification of different types of folds, faults and unconformity from the block models.
3. Exercise on preparation of cross-section profile from the geological maps.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Major Course

Course Code: UMJGET404 Course Title: **Structural Geology**

NOTE FOR PAPER SETTING

Examination Theory/Practical	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1½ Hour	15 Marks
End Semester Examination	100%	3 Hours	60 Marks
Internal Practical	-	-	10 Marks (Based on daily performance only)
External Practical	-	-	(10 Marks Test & 5 Marks Viva)

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five short answer type questions of 2 marks each to be conducted after the completion of 50% syllabus from unit 1.1 to 2.2.

External End Semester Theory Examination will have two sections (A & B):

1. **Section A** shall be of ***12 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. one question from each unit. Each question shall be of **3 marks (All compulsory)**.
2. **Section B** shall be of ***48 Marks*** and will comprise of Eight (8) long answer type questions (**Four to be attempted**), representing whole of the syllabus, i.e. two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of **12 marks**.

Books Recommended:

1. Bhattacharya, A.R., 2022. Introduction to Structural Geology. In: Structural Geology. Springer Textbooks in Earth Sciences, Geography and Environment. Springer, Cham.
2. Robert D. Hatcher and Christopher M Bailey, 2020. Structural Geology Principles, Concepts and Problems – 3rd edition. Oxford University Press.
3. K.S. Valdiya, 2016. The Making of India. Society of Earth Scientists Series, Springer International Publishing Switzerland.
4. Ghosh, S.K., 1993. Structural Geology: Fundamentals and Modern Development, Elseviers.
5. Billings, M. P., 1987. Structural Geology, 4th edition, Prentice-Hall.
6. Park, R. G., 1997. Foundations of Structural Geology, Routledge.
7. Davis, G. H., 2013. Structural Geology of Rocks & Regions, John Wiley & Sons Inc.
8. Jain, A. K., 2014. Structural Geology, Geological society of India.

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Syllabus of Geology at FYUP under CBCS as per NEP-2020

Semester: 4th

For the Examination to be held in Year 2024, 2025 & 2026

Minor Course

Course Code: UMIGET405	Course Title: **Petrology**
CREDITS: 03 (Theory) + 01 (Practical)	Total No. of Lectures (Theory): 45 Hours Practical: 30 Hours
Total Marks: 100 Maximum Marks Theory: 75 Maximum Marks Practical: 25	

Course outcome: The course content provides the students with an over-all knowledge about how the different types of rocks (igneous, sedimentary and metamorphic) are formed. The course content specifies the classifications and the study of different textures and structures produced by the igneous, sedimentary and metamorphic processes.

UNIT 1

1.1 Magma: definition, types and composition. Magma formation: causes of melting; Magma crystallization, Bowen's reaction Principle.

1.2 Magma emplacement: volcanic, hypabyssal and plutonic. Magma diversification: Magmatic differentiation and assimilation.

1.3 Forms of igneous rocks: Concordant and discordant bodies. Textures and structures of igneous rocks.

1.4 Bases of classification of igneous rocks; IUGS classification of igneous rocks.

UNIT 2

2.1 Minerals of igneous rock: Felsic, intermediate, mafic and ultramafic. Mineralogical characteristics of basic rocks and acidic rocks.

2.2 Phase rule; One-component crystallization of silica polymorphs

2.3 Bi-component crystallization of Albite-Anorthite system and Tri-component crystallization of Ab-Di-An system.

2.4 Petrographic description of granitoids, basalt, anorthosite, komatiite, carbonatite, kimberlite and ophiolite.

UNIT 3

3.1 Processes of formation of sedimentary rock. Diagenesis and lithification.

3.2 Texture and structures of sedimentary rocks.

3.3 Classifications of clastic and non-clastic sedimentary rocks.

3.4 Petrographic description of important siliciclastic and carbonate rocks: Conglomerate, breccia, sandstone, greywacke, shale and limestone.

UNIT 4

4.1 Metamorphism: Definition, agents, types, grades and zones of metamorphism. Processes of metamorphism.

4.2 Classification of Metamorphic rocks. Textures and structure of metamorphic rocks.

4.3 Concept and classification of metamorphic facies. Metasomatism and its types.

4.4 Petrographic descriptions of some important metamorphic rocks: Slate, phyllite, schist, gneiss, amphibolite, granulite, eclogite, marble and quartzite.

PRACTICAL

1. Identification of important Igneous rocks in hand specimen and thin sections,
2. Identification of important Sedimentary rocks in hand specimen and thin sections and
3. Identification of important Metamorphic rocks both in hand specimen and thin sections.

NOTE FOR PAPER SETTING

Examination Theory/Practical	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1½ Hour	15 Marks
End Semester Examination	100%	3 Hours	60 Marks
Internal Practical	-	-	10 Marks (Based on daily performance only)
External Practical	-	-	(10 Marks Test & 5 Marks Viva)

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five short answer type questions of 2 marks each to be conducted after the completion of 50% syllabus from unit 1.1 to 2.2.

External End Semester Theory Examination will have two sections (A & B):

1. **Section A** shall be of ***12 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. one question from each unit. Each question shall be of **3 marks** (**All compulsory**).
2. **Section B** shall be of ***48 Marks*** and will comprise of Eight (8) long answer type questions (**Four to be attempted**), representing whole of the syllabus, i.e. two questions from each unit. The students are required to attempt one question from each unit. Each question shall be of **12 marks**.

Books Recommended:

1. Edward J. Tarbuck, Frederick K. Lutgens, Dennis G. Tasa, 2016. Earth: An Introduction to Physical Geology; Pearson.
2. Stephen Marshak, 2015. Earth - Portrait of a Planet; W. W. Norton & Co.
3. Kevin Hefferan, John O'Brien, 2010. Earth Materials; Wiley-Blackwell.