UNIVERSITY OF JAMMU

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

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(24/July/Adp./49)

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 of the subject of **Geology** of Semester **Vth and VIth** for **Four Year Under Graduate Programme (FYUGP)** 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- V	Dec. 2024, 2025 and 2026
	Semester-VI	May 2025, 2026 and 2027

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

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/24/7260-75
Dated: 24/7/24
Copy for information and necessary action to:

1. Dean, Faculty of Science
2. HOD/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

Sunita Sharma 24/7/2024
Deputy Registrar (Academic)
24/7/24

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

Semester	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	
Courses	Certificate		U.G. Diploma		U.G. Degree			4 year U.G. Honors	4 year U.G. Honors with research
Major (3 credits + 1 credit Lab work = 4 credits)	4 credits (1 course)	4 credits (1 course)	8 credits (2 courses)	16 credits (4 courses)	14 credits (three courses: 4 credits) (One course: 2 credits)	16 credits (4 courses)	16 credits (4 courses)	16 credits (4 courses)	4 Credits
	Fundamentals of Geology	Geomorphology	1. Descriptive Mineralogy	1. Stratigraphy (4 credits)	1. Economic Geology (4 credits)	1. Evoloution of Life through Ages (4 credits)	1. Oceanography (4 credits)	1. Sedimentary basin analysis & Petroleum exploration (4 credits)	Research Methodology (4 credits)
			2. Petrology	2. Paleontology (4 credits)	2. Geotectonics (4 credits)	2. Fuel Geology (4 credits)	2. Geophysics (4 credits)	2. Micro-palaeontology (4 credits)	
				3. Optical Mineralogy (4 credits)	3. Hydrogeology (4 credits)	3. Environmental Geology (4 credits)	3. Geochemistry (4 credits)	Quaternary Geology & Climate Change Science (4 credits)	
				4. Structural Geology (4 credits)	4. Field Geology (2 credits)	4. Engineering Geology (4 credits)	4. Remote sensing & GIS in Geology (4 credits)	4. Mineral Exploration (4 credits)	
Minor (3 credits + 1 credit Lab work = 4 credits)	Elements of Geology	Earth surface processes	Introductory Mineralogy	Petrology	Structural Geology	Stratigraphy & Paleontology	Economic Geology & Hydrology	Elements of Applied Geology	—
Multidisciplinary courses (3 credits each)	Introductory Geology	Understanding Landforms	Physical Geology	—	—	—	—	—	—
Skill Enhancement Course (SEC) (2 credits each)	Understanding Disasters	Disaster Management	Disaster Response, Rehabilitation & Recovery	—	Summer Internship	—	—	—	12 credits Project/ Dissertation
Total credits in Geology	13 credits	13 credits	17 credits	20 credits	20 credits	20 credits	20 credits	20 credits	20 credits

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

Semester: 5th

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

Major Course

Course Code: UMJGET501	Course Title: **Economic 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 the students with the processes involved in the formation of various types of ore deposits and to understand the genetic controls exerted by physical and chemical processes on ore formation in various geologic settings.

UNIT 1

1.1 Economic Geology: Definition; Concept of ore and ore deposits, ore minerals, gangue minerals, tenor and grade of ore.

1.2 Nature and morphology of ore deposits, Strategic, critical and essential minerals.

1.3 Origin of ore deposits: syngenetic and epigenetic ore deposits, endogenic and exogenic.

1.4 Metallogenic provinces and epochs.

UNIT 2

2.1 Magmatism as ore forming processes: Early and late magmatic ore deposits.

2.2 Hydrothermal processes; classification of hydrothermal deposits.

2.3 Oxidation and Supergene enrichment ore forming processes.

2.4 Controls of ore deposition.

UNIT 3

3.1 Mechanical concentration deposits: types of placer deposits.

3.2 Chief ores, uses, mode of occurrence and distribution of Iron ore deposits in India.

3.3 Chief ores, uses, mode of occurrence and distribution of Copper ore deposits in India.

3.4 Chief ores, uses, mode of occurrence and distribution of Lead-Zinc ore deposits in India.

UNIT 4

4.1 Radioactive ore minerals: properties, uses, occurrence and distribution in India.

4.2 Refractory and Abrasive minerals: properties, uses, occurrence and distribution in India.

4.3 Chief ores, uses, mode of occurrence and distribution of Aluminium ore deposits in India.

4.4 Mineral wealth of Jammu and Kashmir: metallic and non-metallic minerals, gemstones and coal deposits.

PRACTICAL

1. Study of physical properties and diagnostic features of some of the important metallic ore minerals.
2. Study of physical properties and diagnostic features of some of the important non-metallic ore minerals.
3. Study of physical properties and diagnostic features of some of the important abrasive and refractory minerals.
4. Geological Field Study: Students will be required to carry out one day field work in a suitable area around Jammu.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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:

Course Code: UMJGET501 Course Title: **Economic Geology**

1. Ridley, 2013. Ore deposit geology, Cambridge University Press.
2. H.L. Barnes, 1979. Geochemistry of Hydrothermal Ore Deposits, John Wiley.
3. A. Mookherjee, 2000. Ore Genesis – A Holistic Approach, Allied Publisher.
4. B. Pracejus, 2015. The ore minerals under the microscope: an optical guide. Vol. 3. Elsevier.
5. L. Robb, 2005. Introduction to Ore forming Processes, Blackwell.
6. W.L. Pohl, 2011. Economic Geology: Principles and Practice, Wiley-Blackwell.
7. U. Prasad, 2000. Economic Geology: Economic Mineral Deposits. CBS publishers and distributors.
8. A. Evans, 2011. Ore Geology and Industrial Minerals: An Introduction. Wiley India Pvt Ltd.
9. BGYET-141 and BGYEL-142 of IGNOU.

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

Semester: 5th

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

Major Course

Course Code: UMJGET502	Course Title: **Geotectonics**
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 introduce the advanced ideas of the internal structure of earth and to introduce the latest concept of geomagnetism and its application. The present course will also equip the students with the latest knowledge on tectonic evolution of Himalaya and Indian craton.

UNIT 1

1.1 Seismic Study of the Earth's Interior: Seismic wave fronts and travel times, reflection and refraction of seismic wave energy.

1.2 Defining the crust-mantle Boundary; Discovering the Core-Mantle Boundary and nature of the core.

1.3 Bulk composition of the earth and of its various zones.

1.4 The Earth's gravity: the Geoid; Gravity anomalies and the concept of Isostasy.

UNIT 2

2.1 Wegener's continental drift: its evidences and criticism.

2.2 Discovery of sea floor spreading. Earth's magnetic field; Paleomagnetism; Polar wandering.

2.3 Concept of Lithospheric plate; Basic principles of Plate Tectonics; Plate boundaries and the associated geodynamic elements.

2.4 Causes of plate motions: Convection; Ridge-push and Slab-pull forces; Mechanics of mantle plumes.

UNIT 3

3.1 Geological and tectonic framework of the Indian Subcontinent and its salient characteristics.

3.2 Precambrian evolution of the Indian Shield with special emphasis on the tectonic evolution of the Dharwar Craton.

3.3 Cuddapah Basin: basin evolution and tectonics; Lithostratigraphy and age of the Cuddapah Basin evolution; post-tectonic intrusions.

3.4 Origin and tectonic evolution of the Gondwana basins.

UNIT 4

4.1 Breakup of the Indian Plate from the Gondwana and its evolution during the Jurassic and Cretaceous periods; Geodynamics of the Deccan volcanism.

4.2 India-Asia convergence; Evolution of Volcanic Island Arc and Indus-Tsangpo Suture Zone.

4.3 Growth and evolution of the major tectono-stratigraphic divisions of the Himalayas; Origin and evolution of the Himalayan Foreland Basin (HFB).

4.4 Post-collisional evolutionary tectonics of the Himalayas; Tectonics of Bay of Bengal.

PRACTICAL

1. Visualization exercises, discussions and drawing of the tectonic plates maps.

2. Visualization exercises, discussions and drawing of the movement of the Indian plate after breaking from the Gondwana.
3. Study of the tectonic divisions of Northwestern Himalaya.
4. Geological field trip: Students are required to complete three days of fieldwork in a suitable geological area and submit a report.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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. K.C. Condie, 2003. Plate Tectonics and Crustal Evolution, Butterworth-Heinemann.
2. A. Cox, 1973. Plate Tectonics and Geomagnetic Reversals, W.H. Freeman & Co. Ltd.
3. P. Kearey, K.A. Klepeis, F.J. Vine, 2008. Global tectonics – 3rd Ed, Willey-Blackwell.
4. W. Frisch, M. Meschede, R.C. Blakey, 2022. Plate Tectonics – 2nd Ed, Springer.
5. A. Gansser, 1964. Geology of the Himalayas, Wiley InterScience.
6. Stephen Marshak, 2018. Earth – Portrait of a Planet, W.W. Norton & Co.
7. K.S. Valdiya, 2016. The Making of India-Geodynamic Evolution, Springer.
8. Chatterjee et al., 2013. The longest voyage: Tectonic, magmatic, and paleoclimatic evolution of the Indian plate during its northward flight from Gondwana to Asia. Gondwana Research, v. 23.
9. M.E.A. Mondal (ed.), 2019. Geological Evolution of the Precambrian Indian Shield, Society of Earth Scientists Series.

UNIVERSITY OF JAMMU

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

Semester: 5th

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

Major Course

Course Code: UMJGET503	Course Title: **Hydrogeology**
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 acquaint the students with the origin and causative factors, occurrence, distribution, quality and general behaviour of groundwater under varying geological and geographical conditions.

UNIT 1

1.1 Hydrogeology: Definition and scope; Genetic classification of water.
1.2 Origin of water — magmatic, metamorphic, juvenile, connate, marine, volcanic and plutonic water. Subsurface movement and vertical distribution of groundwater.

1.3 Hydrological properties of rock-formations (aquifers): porosity and effective porosity, permeability and intrinsic permeability.

1.4 Physical properties of the reservoir rocks: Hydraulic conductivity, transmissivity, storativity, specific yield and specific retention.

UNIT 2

2.1 Genetic and hydrologic classification of reservoir rocks and boundary conditions; Darcy's law and its validity

2.2 Hydrological cycle and its importance. Drainage basin and groundwater basin.

2.2 Mode of occurrence of groundwater in unconsolidated and semi-consolidated formations.

2.4 Springs — classification, distribution and economic importance.

UNIT 3

3.1 Consumptive and conjunctive use of surface and groundwater.

3.2 Precipitation — process, causes, types and measurements.

3.3 Evapotranspiration — process, causes, factors influencing and measurements in the field.

3.4 Infiltration — process, factors effecting, measurements, relation to runoff and computation of runoff.

UNIT 4

4.1 Rainwater harvesting and other methods of artificial recharge of groundwater: natural and artificial groundwater recharging methods.

4.2 Physical and chemical properties of water; quality criteria for domestic, irrigation and industrial use; graphic presentation of water quality data.

4.3 Groundwater provinces of India and their water quality.

4.4 Sea water intrusion in coastal aquifers and remedial measures.

PRACTICAL

1. Study of hydrogeological models.
2. Estimation of physical and hydrological properties: Specific discharge, hydraulic conductivity, porosity and permeability from the given data.
3. Preparation and interpretation of water table maps.
4. Geological Field Study: Students will be required to carry out one day field work in a suitable area around Jammu.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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**.

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

Semester: 5th

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

Major Course

Course Code: UMJGET503 Course Title: **Hydrogeology**

Books Recommended:

1. D. K. Todd and Larry W. Mays, 2011. Groundwater Hydrology, Wiley India Pvt. Limited.
2. H.M. Raghunath 2015, Hydrology, New Age International Publishers.
3. S.N. Davis and R.J.M. Wiest 1966, Hydrogeology, John Wiley and Sons.
4. P.J. Rami Reddy, 2016. A text book of Hydrology, Laxmi Publications.
5. C.W. Fetter, 4th Ed, 2014, Applied Hydrogeology. Pearson.
6. S. Akhauri and H.M. Akhauri, 2016. Fundamentals of Hydrogeology, Zorba Books.

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

Semester: 5th

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

Major Course

Course Code: UMJGET504	Course Title: Field Geology
CREDITS: 02	Total No. of Lectures: 30 Hours
Maximum Marks: 50	

Course outcome: Upon completion of this course, the students will develop a solid foundation in geological field study through engaging classroom instruction. They will acquire proficiency in practical methods of observation, enabling them to keenly interpret geological features in diverse terrains. This course equips students with the knowledge and practical skills necessary for effective geological fieldwork, laying the groundwork for successful exploration and analysis in geological sciences.

UNIT 1

1.1 Scope of Geological field work; Topographic maps (Toposheets) and reading contours and topography (at various scales) on the toposheet.

1.2 Orienting the toposheet with respect to your Look-direction.

1.3 Field Equipment: Brunton Compass and Clinometers, Hammers, Field Notebooks; Using the Brunton Compass for triangulation.

1.4 Collection and plotting of planar and linear structural data in the field using compass and clinometer: Strike and Dip, Trend and Plunge.

UNIT 2

2.1 Geological maps: Classifications of the features, contours, scale, legend; Methods of Geological Mapping: Traversing, Drilling, Plane Table Mapping, Exposure Mapping.

2.2 Creating cross sections on geological maps.

2.3 Field relations of igneous rocks; Recording features of igneous rocks.

2.4 Recording features of metamorphic rocks.

UNIT 3

3.1 Field interpretation of sedimentary material: nature of parent rock; physiographic condition at the time of deposition.

3.2 Bedding; causes of tilting and folding of beds; Age of joints; Relation of joints to erosion.

3.3 Recognition of fold in the field.

3.4 Recognition of fault in the field.

NOTE FOR PAPER SETTING

Theory Examination	Syllabus to be covered in Examination	Time allotted for Exam	% weightage
Mid Semester Assessment Test	Upto 50%	1 Hour	10 Marks
End Semester	100%	2½ Hours	40 Marks

UNIVERSITY OF JAMMU

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

Semester: 5th

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

Major Course

Course Code: UMJGET504			Course Title: Field Geology
Examination			

Mid Semester Assessment Test shall consist of one long answer type question of 5 marks and five very short answer type questions of 1 mark each to be conducted after the completion of 50% syllabus from unit 1.

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

1. **Section A** shall be of ***10 Marks*** and will comprise of four (4) short answer type questions representing all units/syllabus, i.e. at least one question from each unit. Each question shall be of **2½ marks** (**All compulsory**).
2. **Section B** shall be of ***30 Marks*** and will comprise of six (6) long answer type questions (**Three 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 **10 marks**.

Books Recommended:

1. Billings, M.P, 1984. Structural Geology, Prentice Hall of India.
2. Lahee, F.H., 1961. Field Geology. McGraw Hills.
3. Robert Compton, 1962. Manual of Field Geology, John Wiley & sons.
4. Mathur S.M., 2001. Guide to Field Geology, PHI Learning New Delhi.
5. J. W. Barnes and R. J. Lisle, 2004. Basic Geological Mapping, John Wiley & Sons.
6. T. Freeman, 1999. Procedures in Field Geology, Blackwell Science.
7. N. W. Gokhale, 2001. A Guide to Field Geology, CBS Publishers.
8. A. L. Koe, 2010. Geological Field Techniques, Wiley Blackwell.

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

Semester: 5th

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

Minor Course

Course Code: UMIGET505	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 Structural Geology: Definition, methodology and significance.
1.2 The direction system; attitude of planar and linear structures.
1.3 Introduction to deformation and its components; homogenous and heterogenous deformation.
1.4 Fundamentals of stress and strain in rocks. Factors controlling deformation of rocks.

UNIT 2

2.1 Folds and folding: definition, parts of a fold and styles of a fold.
2.2 Various classifications of folds.
2.3 Mechanics of folding: active folding (buckling), passive folding and bending.
2.4 Recognition of folds in the field.

UNIT 3

3.1 Boundin structures: Origin, geometry and types.
3.2 Faults and faulting: definition, geometry and separation of a fault.
3.3 Different classification schemes of faults.
3.4 Anderson's theory 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.

PRACTICAL

1. Identification of different types of folds, faults and unconformity from the block models.
2. Exercise on preparation of cross-section profile from the geological maps.
3. Geological field study: Students are required to complete 01 day of fieldwork in a suitable geological area around Jammu.

UNIVERSITY OF JAMMU

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

Semester: 5th

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

Minor Course

Course Code: UMIGET505 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: 5th

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

Internship

Course Code: USEGET506	Course Title: **Summer Internship**
CREDITS: 02	Contact Hours: 15 days
Total Marks: 50	

Description:

During the summer term, all Geology students will participate in internships or apprenticeships either within firms, industries, or organizations, or in labs alongside faculty and researchers from their own or other research institutions. These internships aim to provide practical learning experiences that enhance students' employability.

Students will have opportunities to intern with local roads, bridge, or tunnel construction companies, as well as government organizations such as the Geological Survey of India (GSI), Department of Geology and Mining (DGM), National Disaster Management Authority (NDMA), and State Disaster Response Force (SDRF), among others. This varied exposure aims to actively engage students in the practical application of their education.

Each student's internship will be supervised by a college faculty member designated as an Internship Supervisor. Upon completion of the summer internship, students are required to submit a report detailing their work, which must be signed by both the Internship Supervisor and the College Principal. The Internship Report will undergo internal evaluation by an examination board appointed by the College Principal.

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET601	Course Title: **Evolution of Life through Ages**
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: Upon the completion of this course, students will understand the evolution and extinction of life across geological time, and will be able to describe fossils, showcasing proficiency in their taxonomic classification. This knowledge will equip students to analyse and interpret the significance of fossils, fostering a deeper understanding of Earth's history and biological evolution.

UNIT 1

1.1 Fossils: definition, types and significance of fossils.
1.2 The origin of life: various models/theories; Evidences for the origin of life.
1.3 Geological Time Scale with emphasis on major bio-events.
1.4 Fossilization processes, conditions and modes of fossil preservation.

UNIT 2

2.1 Geobiology: definition, Biosphere as a system, processes and products.
2.2 Archaean life: the fossil record; Transition from Archaean to Proterozoic, the oxygen revolution and radiation of life; Early Proterozoic life.
2.3 Neoproterozoic: beginning of modern life; Evolution of animals – traces, imprints, skeletal remains, Precambrian macrofossils.
2.4 Early Paleozoic: The Cambrian explosion; Ordovician life – The Great Ordovician radiation, extinction and diversity at sea, invasion of land.

UNIT 3

3.1 Late Palaeozoic: New forms of marine life, reefs and aragonite seas; Plant life on land; Freshwater and terrestrial animals; the Late Permian extinction.
3.2 Origin of vertebrates; Origin of tetrapods – Life out of water. Climate Change during the Phanerozoic.
3.3 Early Mesozoic: a new biota in the oceans, Life on land – Gymnosperm Flora.
3.4 Concepts of origin of reptiles, birds and mammals.

UNIT 4

4.1 Early Mesozoic: The terrestrial animals – Dinosaur Origins and diversity; early mammals and birds, Jurassic world and mass extinctions.
4.2 Cretaceous world: pelagic life, seafloor life, the rise of modern marine predators, flowering plants conquer the land; The terminal Cretaceous extinction.
4.3 Cenozoic Life: Aftermath of end Cretaceous mass extinction – radiation of placental mammals.
4.4 Paleogene world: evolution of marine life, terrestrial plants and terrestrial and freshwater animals. Neogene world: life in aquatic environments, life on land.

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET601 Course Title: **Evolution of Life through Ages**

PRACTICAL

1. Study of modes of fossil preservation.
2. Study of fossils from different stratigraphic levels.
3. Exercises related to major evolutionary trends in important groups of animals and plants.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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. S.M. Stanley, 2014. Earth System History, W.H. Freeman and Company.
2. M.J. Benton and D. Harper, 1997. Basic Palaeontology, Pearson Education Ltd.
3. David E. Fastovsky and David B. Weishampel, 1996. The Evolution and Extinction of the Dinosaurs, Cambridge University Press.
4. Brian K. Hall and B. Hallgrimsson, 2008. Strickberg's Evolution, 4th Ed. Jones & Bartlett Publishers.

5. M.J. Benton and D. Harper, 2009. Introduction to Paleobiology and the Fossil Record, Blackwell publishing.
6. Bruce S. Lieberman and Roger Kaesler, 2010. Evolution and the Fossil Record, Blackwell publishing.
7. Knight, C.R., 2001. Life through Ages, Indiana Univ. Press.
8. Waquar Ahmed and Rahul Magotra, 2022. Evolution of Life through Geological ages, Malhotra Publishers.

UNIVERSITY OF JAMMU

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET602	Course Title: **Fuel 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: Upon the completion of this course, the students will gain a thorough understanding of coal's origin and distribution, along with insights into the genesis, exploration, geological aspects, and spatial distribution of oil and gas in the Indian context.

UNIT 1

1.1 Coal: Definition, varieties and its ranks; Origin of coal: In-situ and drift theories.
1.2 Fundamentals of coal petrology – Introduction to lithotypes, micro lithotypes and macerals.
1.3 Distribution of coal in India: Gondwana and tertiary coal fields.
1.4 Proximate and Ultimate Analyses; Coal Bed Methane (CBM): Global and Indian scenario.

UNIT 2

2.1 Origin of oil: organic and inorganic theories.
2.2 Petroleum: Composition, classification, physical and chemical properties – crude oil, natural gases.
2.3 Organic matter (production, accumulation and transformation) and kerogen (composition and classification): a geological perspective.
2.4 Migration of oil and gas; Concept of primary and secondary migration.

UNIT 3

3.1 Reservoir rocks: General attributes and petrophysical properties; Classification of reservoir rocks – clastic and chemical.
3.2 Cap rocks: Definition and general properties.
3.3 Petroleum traps: Nomenclature, classification and types *viz*. structural, stratigraphic, diapiric (salt domes etc.), combination and hydrodynamic.
3.4 Mechanism and timing of trap development relative to petroleum migration and reservoir development.

UNIT 4

4.1 Oil and gas exploration – source rock identification, oil-source rock correlation and locating petroleum prospects.
4.2 Distribution of oil and gas reserves in India.
4.3 Conventional (true and hybrid) and unconventional petroleum systems (e.g. shale gas, oil shales, tar sands) – understanding from case histories.
4.4 Radioactive minerals: Occurrence and distribution in India; Status of the nuclear fuel in India.

PRACTICAL

Course Code: UMJGET602 Course Title: **Fuel Geology**

1. Study of physical properties of coal samples; spotting and description of source and reservoir rocks.
2. Determine porosity and permeability of the reservoir rock samples; Draw and describe various stratigraphic and structural traps.
3. Exercises on calculation of oil and gas reserves.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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. Chandra D., 2007. Chandra's Textbook on applied coal petrology, Jijnasa Publishing House.
2. Shelly R. C., 2014. Elements of Petroleum geology, 3rd Ed., Academic Press.
3. Bjorlykke, K., 1989. Sedimentology and petroleum geology. Springer-Verlag.
4. Bastia, R., & Radhakrishna, M., 2012. Basin evolution and petroleum prospectivity of the continental margins of India (Vol. 59), Elsevier Ltd.
5. Levorson, A.I., 2004. Geology of Petroleum, CBS Publishers.
6. Krishnnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.

7. Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
8. Umeshwar Prasad, 2003. Economic Geology. CBS Publishers.

UNIVERSITY OF JAMMU

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET603	Course Title: **Environmental 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: This course is designed to introduce the fundamental concepts and the pivotal role of geology in environmental studies. It covers the examination of various facets of geo-hazards, emphasizing strategies for their mitigation. Additionally, the course imparts knowledge about pollutions and explores remedial measures.

UNIT 1

1.1 Environmental Geology: Definition, scope; Inter-relationship of Earth, Man, and Environment; Population and environmental dynamics.

1.2 Elements of the geosphere: Lithosphere, biosphere, hydrosphere and atmosphere.

1.3 Composition and vertical thermal structure of the atmosphere.

1.4 Weather and climate, climate controlling factors; Energy balance: The solar source and the earth's heat budget.

UNIT 2

2.1 Air pollution: Types and sources; Control of air pollution.

2.2 Water pollution: sources, consequences, treatment and control of water pollution.

2.3 Pollution due to solid waste, disposal of solid wastes and solid waste management.

2.4 Soil: types, deterioration and conservation.

UNIT 3

3.1 Factors governing floods; flood characteristics; Flood hazards and their mitigation.

3.2 Factors influencing slope stability; Mass wasting types and consequences of mass movements; Preventive measures.

3.3 Seismic hazards: causes and consequences; Seismic conditions in India; Preventive measures of earthquake.

3.4 Volcanic hazards: volatiles, pyroclastic flows, toxic gases; Nature, prediction and mitigation of volcanic hazards.

UNIT 4

4.1 Energy resources; Environmental effects of various energy resources i.e. petroleum, natural gas, nuclear, hydropower, wind and solar.

4.2 Mineral resources and the environmental impact of exploitation, processing and smelting of minerals Environmental management of mining.

4.3 Global warming – increase of CO_2, CH_4 and N_2O due to natural and anthropogenic activities. Magnitude of ozone depletion and its impact; Suggestive measures.

4.4 Medical Geology – trace elements and health; controls on elemental intake: iodine, fluorine, zinc, selenium.

UNIVERSITY OF JAMMU

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET603 Course Title: **Environmental Geology**

PRACTICAL

1. Exercise on preparation of geological hazard zonation maps.
2. Explore the impact of climate change on geological processes (e.g., glacial retreat, sea-level rise) and discuss how these changes can influence the environment.
3. Analyze the environmental impact of mining activities in a specific area, considering factors like soil degradation, water contamination, and habitat disruption.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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. Montgomery, C.W. 2010. Environmental Geology, McGraw Hill Companies.
2. Keller, E.A., 2017. Environmental Geology, Pearson Education.
3. Valdiya, K.S., 2013. Environmental Geology, McGraw Hill Education India.
4. Merritts, D., Wet, A. and Menking, K., 1998. Environmental Geology, Cambridge Univ Press.
5. Lutgen, F.K. & Tarbuck, E.J. The Atmosphere: An introduction to meteorology.

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6. Selinus (Ed), 2013. Essentials of Medical Geology, Springer Science Business Media Dordrecht.

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Major Course

Course Code: UMJGET604	Course Title: **Engineering 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: Upon completion of this course, students will gain a comprehensive understanding of construction materials and their physical properties. They will be able to analyze the influence of geological conditions on the foundation and design of various structures, as well as acquire knowledge about geological considerations in the construction of dams, tunnels, bridges, and roads. Additionally, students will be familiarized with rock mass classification principles.

UNIT 1

1.1 Geology and Civil Engineering: Role of Engineering geologists in planning, design and construction of major man-made structural features.
1.2 Intact rock and rock mass properties.
1.3 Rock aggregates and their significance as construction material.
1.4 Foundation treatment; Grouting, rock bolting and other support mechanisms.

UNIT 2

2.1 Physical and engineering properties of soils.
2.2 Bridges: Terminology and types; stability and foundation of bridges.
2.3 Tunnels: types of tunnels, Geological investigation of tunnel sites.
2.4 Tunnelling methods: Fore poling method, Needle beam method, English method, Belgian method, Heading and bench method, Full face method and NATM.

UNIT 3

3.1 Concept, mechanism and significance of Rock Quality Designation (RQD).
3.2 Concept, mechanism and significance of Rock Structure Rating (RSR).
3.3 Concept, mechanism and significance of Rock Mass Rating (RMR).
3.4 Concept, mechanism and significance of Tunnelling Quality Index (Q).

UNIT 4

4.1 Types of dams; Forces acting on dams; Geological considerations for dams and reservoirs; Problems associated with dam sites and their corresponding reservoirs.
4.2 Geotechnical and environmental implications in the dam construction.
4.3 Geological considerations for the construction of roads: hilly regions, marshy regions, water logged areas and permafrost regions.
4.4 Geological considerations for airport constructions; Case histories related to Indian Civil Engineering Projects.

PRACTICAL

1. Computation of reservoir area, catchment area and reservoir capacity.
2. Computation of Index properties of rocks.
3. Computation of RQD, RSR, RMR and 'Q'.
4. Geological field training: Students are required to complete 2 days of fieldwork in a nearby tunnel, bridge, road or dam construction sites so as to have 'hands-on' experience and submit a report.

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
Practical	-		10 Marks (Based on daily performance only)
	-		(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. Johnson, R.B. and De Graf, J.V., 1988. Principles of Engineering Geology, John Wiley.
2. Goodman, R.E., 1993. Engineering Geology: Rock in engineering constructions. John Wiley & Sons, N.Y.
3. Waltham, T., 2009. Foundations of Engineering Geology (3rd Ed.) Taylor & Francis.
4. Bell: F.G., 2006. Basic Environmental and Engineering Geology, Whittles Publishing.
5. Bell, .F.G., 2007. Engineering Geology, Butterworth-Heineman.

6. Krynin, D.P. and Judd W.R., 1957. Principles of Engineering Geology and Geotechnique, McGraw Hill (CBS Publ).

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Minor Course

Course Code: UMIGET605	Course Title: **Stratigraphy & 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 course content is intended to familiarize the students with the tectono-stratigraphic framework of various lithostratigraphic units of India spanning Archaean to Holocene. The students will also be able to understand the morphology, evolution and extinction of life through the geologic time.

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 The Dharwar Supergroup: distribution, lithology and classification.
2.2 Distribution, lithologies and classifications of the Cuddapah Supergroup.
2.3 Distribution, lithologies and classifications of the Vindhyan Supergroup.
2.4 Classification, distribution and economic importance of Gondwana rocks in India.

UNIT 3

3.1 Salkhala rocks of Jammu and Kashmir, Shiwalik System.
3.2 Definition and types of fossils; Significance of fossils; Conditions of fossilization and modes of preservation of fossils.
3.3 Morphology and geological distribution of Trilobita and Brachiopoda.
3.4 Morphology and geological distribution of Cephalopoda and Gastropoda.

UNIT 4

4.1 Morphology and geological distribution of Pelecypoda.
4.2 Origin, diversity and extinction of Dinosaurs.
4.3 Introduction to the human evolution.
4.4 Morphology, distribution and significance of the Gondwana flora.

PRACTICAL

1. Preparation of lithostratigraphic maps of India showing distribution of important geological formations.
2. Morphological characters, systematic position and age of fossil genera pertaining to Brachiopoda, Pelecypoda, Cephalopoda, Trilobita and Gastropoda.

UNIVERSITY OF JAMMU

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

Semester: 6th

For the Examination to be held in Year 2025, 2026 & 2027

Minor Course

Course Code: UMIGET605 Course Title: **Stratigraphy & 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. P. Doyle, and M.R. Bennett, 1996. Unlocking the Stratigraphic Record, John Willey.
2. S.M. Naqvi, 2005. Geology and Evolution of the Indian Plate: From Hadean to Holocene 4 Ga to 4 Ka. Capital Pub., New Delhi.
3. E.H. Pascoe, 1968. A Manual of the Geology of India & Burma, Govt. of India Press, Delhi.
4. R.M. Schoch, 1989. Stratigraphy: Principles and Methods, Van Nostrand Reinhold, NY.
5. R. Vaidyanathan and M. Ramakrishnan, 2008. Geology of India, Geological Society of India, Vol. I–II.
6. E.K. Clarkson, 2013. Invertebrate palaeontology and Evolution, Blackwell Science.
7. Benton, 2005. Vertebrate Palaeontology, Blackwell Publishing.
8. P.W. Jackson, 2019. Introducing Palaeontology: A Guide to Ancient Life, Dunedin Academic Press Ltd.
9. R. Enay, 2012. Palaeontology of Invertebrates, Springer-Verlag.

10. M. Davies, 2008. An Introduction to Palaeontology, Read Books.
11. E.H. Colbert and E.C. Minkoff, 2001. Evolution of vertebrates, Wiley Liss.