SCHEME B-1

M.Sc. TWO YEARS
SUBJECT: GEOLOGY
2 Year PG PROGRAMME
(English)

BOARD OF STUDIES IN GEOLOGY

For 2-Year PG Programme

Scheme B-1(For Courses of Science & Arts Discipline having Major Practicum Component)

Year / Semester		Course Type				Total Credits
		Courses Level	Core Courses / Dissertation	Practicum Courses	Internship/Apprenticeship / Seminar OR VAC (CHM/EESC)	
First Year	Sem-I	400 400	CC-11 6 Credits) CC-12 (6 Credits)	PC-11 (4 Credits) PC-12 (4 Credits)	Internship/Apprenticeship ***OR*** Seminar (2 Credits)	22
	Sem-II	400 500	CC-21 (6 Credits) CC-22 (6 Credits)	PC-21 (4 Credits) PC-22 (4 Credits)	VAC (CHM/EESC) (2 Credits)	22
Note: *Students who exit at the end of 1st year shall be awarded a Postgraduate Diploma.*						

OPTION-1: Only Course Work
(Applicable to all UTDs/Colleges)

Year / Semester		Courses Level	Core Courses / Dissertation	Practicum Courses	Internship/Apprenticeship / Seminar OR VAC (CHM/EESC)	Total Credits
Second Year	Sem-III	500 500	CC-31 (6 Credits) CC-32 (6 Credits)	PC-31 (4 Credits) PC-32 (4 Credits)	Internship/Apprenticeship ***OR*** Seminar (2 Credits)	22
	Sem-IV	500 500	CC-41 (6 Credits) CC-42 (6 Credits)	PC-41 (4 Credits) PC-42 (4 Credits)	VAC (CHM/EESC)(2 Credits)	22

OPTION-2: Course Work & Research Work
(Applicable to the UTDs/Colleges having research centers recognized by the University)

Year / Semester		Courses Level	Core Courses / Dissertation	Practicum Courses	Seminar / Research thesis/Project/Patent	Total Credits
Second Year	Sem-III	500 500	CC-31 (6 Credits) CC-32 (6 Credits)	PC-31 (4 Credits) PC-32 (4 Credits)	Seminar (2 Credits)	22
	Sem-IV	-	-	-	Research thesis / Project / Patent(22 Credits)	22

OPTION-3: Only Research Work
(Applicable to the UTDs/Colleges having research centers recognized by the University)

Second Year	Sem-III	Research thesis/ Research Project / Patent(22 Credits)	22
	Sem-IV	Research thesis / Research Project / Patent(22 Credits)	22

Note: (1) UTDs/Colleges with Research Centers have the choice of running all the OPTIONS mentioned above.

(2) Students having 4-Year Under Graduate Degree (Honours / Honours with Research) are eligible for direct lateral entry in theSemester-III of 2-Year PG Programme.

Theory Paper: Scheme B-1 for Two Year PG Program

Part A- Introduction			
Program:**2 Year PG**	Class: **M.Sc. I Semester**	**Year: 2025**	**Session:** 2025-26
Subject: **Geology**			

1	**Course Code**	**CC11**	
2	**Course Title**	**Geomorphology, Geodynamics and Remote Sensing**	
3	**Course Type**	Core Course	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	**Course Learning Outcome (CLO)**	Students will acquire insight in the various fundamental and advance components and aspects of the subject **Geomorphology, Geodynamics and Remote Sensing.** Students will also develop theoretical reasoning and knowledge for practical use. Ancient Indian knowledge about Indian Rivers, and other natural agents, various Landforms.	
7	**Credit Value**	6	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40

Part B : Content of the Course

Total No. Of Lectures- Tutorial-Practicum (in hours per week): 6
L-T-P: 90

Unit	**Topics**	**No. Of Lectures**
I	*Ancient Indian knowledge about Nakshatra system and Solar system.* Earth and the solar system, Meteorites and other extra-terrestrial materials. Planetary evolution of the earth and its internal structure. *Ancient Indian knowledge about Indian Rivers, and various major Landforms of India*. Vedic Saraswati River. Modern Basic principles of geomorphology; Weathering and soil formations; Mass wasting. Influence of climate on processes. Concept of erosion cycles; Geomorphic cycles and their interpretation; Morphology and its relation to structure and lithology. Activities: Poster presentation, Seminar-PPT	18
II	Fluvial Geomorphology, Rivers valley development – base level and its varieties, graded streams. Classifications of valleys. Drainage patterns and their significance. Drainage basin analysis. Arid zones and Wind action landforms, coastal regions geomorphology, 'Karst' landscapes and glaciated ranges and landforms. Geomorphic mapping. Orogeny and epeirogeny. Geosynclines and its types. Activities: Poster presentation, Seminar-PPT	18

III	Isostasy: Development of the concept, isostatic anomalies, isostatic models. Orogeny and epeirogeny. Geosynclines and its types. Continental drift: geological and geophysical evidences, mechanics, present status. Evidences of continental drift and polar wandering. Gravity and magnetic anomalies at Mid-ocean ridges, deep sea trenches, continental shield areas and mountain chains. Activities: Poster presentation, Seminar-PPT	18
IV	Concepts of Plate Tectonics and sea floor spreading. Types of plate boundaries and their features. Geodynamics of the Indian plate. Arc-Trench system, volcanic mountain chain. Triple junctions and their stability. Causes of plate motion. Seismic belts of the Earth. Seismicity and plate movements. Earthquake zones of India. Activities: Poster presentation, Seminar-PPT	18
V	Concepts and principles of aerial photography and photogrammetry; Orbiting satellites and sensor systems; Indian satellite remote sensing: data products and their interpretation. Digital image processing. Application of remote sensing in landform and land use mapping, structural mapping, hydrogeological studies and mineral exploration. Global and Indian Space Missions. Geographic Information System (GIS): principles and applications. Global Positioning System (GPS) - its applications. Activities: Poster presentation, Seminar-PPT	18
Keywords/ Tags: Geodynamics, Geosynclines, Mid-ocean ridges, GIS, GPS.		

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Merh S. S., Radhadrishna B. P.: M-42. Vedic Sarasvati – Evolutionary History of a Lost River of Northwestern India, Geol soc. India

Savinder Singh, 1998: Geomorphology. Prayag Pustak Bhawan

Pandey S N 2001: Principles and Applications of Photo Geology. New Age

Tripathi and Bajpai ed. 2000: Remote Sensing in Geosciences

Condie K C: Plate Tectonics and Crustal Evolution.

Davies, Geoffrey F. 1999: Dynamic Earth. 1e Cambridge Univ Press Gerald

Gutenburg Beno: Internal Constitution of the Earth. Dover

Hodgson, J H: Earthquake and Earth's Structures. Prentice Hall

Holmes, Doris L and Arthur: Holmes' Principles of Physical Geology. Wiley

Martin H P Bott, 1982: The Interior of the Earth. Edward Arnold

Schubert Donald L. Turcotte, 2002: Geodynamics. 2e, Cambridge Univ Press

Strahler, A N, 1971: Earth Sciences. Harper and Row

Wyllie, Peter J: The Dynamic Earth. Wiley

Wyllie, Peter J: The Way the Earth Works. Wiley

David Lang: The Earth System. Brown Publishers

Halis, J R: Applied Geomorphology.

Holmes, Doris L and Arthur Holmes, 1978: Principles of Physical Geology. Wiley

Oscar Diedrich von Engeln , 1953: Geomorphology, Systematic and Regional. McMillan

Small, R J, 1970: Study of Landforms. Cambridge

Thornbury, W D 1968: Principles of Geomorphology. Wiley

Curran P J, 1985: Principles of Remote Sensing. ELBS/Longman

Drury S A, 1987: Image Interpretation in Geology. Allen and Unwin

Jensen, J A, 2006 : Remote Sensing of the Environment. Prentice Hall

Lueder D R, 2003: Aerial Photographic Interpretation: Principles and Applications. Textbook publisher

Miller V C, 1961: Photo Geology. McGraw

Pratt, William K, 2001: Digital Image Processing PIKS Scientific Inside. J Wiley

Wolf, P R, 1974: Elements of Photogrammetry. McGraw

https://www.youtube.com/watch?v=AmWSSFP7dLU
The Chronology and Geography of Mahabharata: A ...
YouTube · Sangam Talks

https://www.youtube.com/watch?v=lDhNkbrdgsI&t=411s
Wonders of Ancient Indian Science & Technology | Dr Raj Vedam | #SangamTalks

https://www.researchgate.net/publication/237142076_Geographical_Knowledge_Of_Ancient_India

https://www.youtube.com/watch?v=BQ0w-WytFpk
geography of Ramayana

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Class Test/Presentation/ Assignment/ Quiz/Debate/Poster making/Group Discussion etc.	**40**
External Assessment : Mid Term Examination	**Section(A):** Very Short Questions **Section (B):** Short Questions **Section(C):** Long Questions	**60**

Any remarks/Suggestions:

Practicum Paper: Scheme B-1 for Two Year PG Program

Part A- Introduction				
Program: 2-Year PG	**Class:** M.Sc. I Semester		**Year: 2025**	**Session:** 2025-26
Subject: **Geology**				
1	**Course Code**	**PC11**		
2	**Course Title**	**Geodynamics, Geomorphology and Remote Sensing**		
3	**Course Type**	Practical Course		
	Course Level	400		
4	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject		
5	**Course Learning Outcome (CLO)**	The Practicum Part will enhance the theoretical reasoning by directly exposing the students to representative samples/ models/ problems. This will help students improve the understanding of the subject **Geomorphology, Geodynamics and Remote Sensing** in totality. Understanding of ancient India knowledge of River Systems and mountains		
6	**Credit Value**	4		
7	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40	

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	No. Of Lectures
Morphometric analysis of third order basins. Morphometric analysis of drainage basins. Morphometric analysis of Terrains. Elements in photo-interpretation, Study and nature of aerial photographs resolution, mosaics, symbols, gully, pattern and drainage analysis, image parallax; determination of scale, height, dip, slope, vertical exaggeration and image distortion; detailed study of imageries. Digitization of area maps in GIS environments and generation of data based on digital data in open access GIS software. Group discussion on Indian approach towards Rivers, Seas and Mountains.	120 Hrs

Keywords/ Tags: Morphometric analysis, drainage basins, GIS softwere

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Merh S. S., Radhadrishna B. P.: M-42. Vedic Sarasvati – Evolutionary History of a Lost River of Northwestern India, Geol soc. India

Savinder Singh, 1998: Geomorphology. Prayag Pustak Bhawan
Pandey S N 2001: Principles and Applications of Photo Geology. New Age
Tripathi and Bajpai ed. 2000: Remote Sensing in Geosciences
Condie K C: Plate Tectonics and Crustal Evolution.
Davies, Geoffrey F. 1999: Dynamic Earth. 1e Cambridge Univ Press Gerald
Gutenburg Beno: Internal Constitution of the Earth. Dover
Hodgson, J H: Earthquake and Earth's Structures. Prentice Hall
Holmes, Doris L and Arthur: Holmes' Principles of Physical Geology. Wiley
Martin H P Bott, 1982: The Interior of the Earth. Edward Arnold
Schubert Donald L. Turcotte, 2002: Geodynamics. 2e, Cambridge Univ Press
Strahler, A N, 1971: Earth Sciences. Harper and Row
Wyllie, Peter J: The Dynamic Earth. Wiley
Wyllie, Peter J: The Way the Earth Works. Wiley
David Lang: The Earth System. Brown Publishers
Halis, J R: Applied Geomorphology.
Holmes, Doris L and Arthur Holmes, 1978: Principles of Physical Geology. Wiley
Oscar Diedrich von Engeln , 1953: Geomorphology, Systematic and Regional. McMillan
Small, R J, 1970: Study of Landforms. Cambridge
Thornbury, W D 1968: Principles of Geomorphology. Wiley
Curran P J, 1985: Principles of Remote Sensing. ELBS/Longman
Drury S A, 1987: Image Interpretation in Geology. Allen and Unwin
Jensen, J A, 2006 : Remote Sensing of the Environment. Prentice Hall
Lueder D R, 2003: Aerial Photographic Interpretation: Principles and Applications. Textbook publisher
Miller V C, 1961: Photo Geology. McGraw
Pratt, William K, 2001: Digital Image Processing PIKS Scientific Inside. J Wiley
Wolf, P R, 1974: Elements of Photogrammetry. McGraw

https://www.youtube.com/watch?v=AmWSSFP7dLU
The Chronology and Geography of Mahabharata: A ...
YouTube · Sangam Talks
https://www.youtube.com/watch?v=lDhNkbrdgsI&t=411s
Wonders of Ancient Indian Science & Technology | Dr Raj Vedam | #SangamTalks
https://www.researchgate.net/publication/237142076_Geographical_Knowledge_Of_Ancient_India
https://www.youtube.com/watch?v=BQ0w-WytFpk
geography of Ramayana

Part D- Assessment and Evaluation		
Suggested Continuous evaluation Methods: Maximum Marks: **100** Continuous Comprehensive evaluation (CCE): **40** Mid Term Examination: **60**		
Internal Assessment : Continuous Comprehensive evaluation (CCE):	Seminar/Demonstration/Assignment etc.	**40**
External Assessment : Mid Term Examination	Table work/ Experiments, Practical Record Files, Viva-Voce	**60**
Any remarks/Suggestions:		

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology**			

1	**Course Code**	**CC12**	
2	**Course Title**	**Structural Geology and Mineralogy**	
3	**Course Type**	Core Course	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	**Course Learning Outcome (CLO)**	Students will acquire insight in the various fundamental and advance components and aspects of the subject **Structural Geology and Mineralogy.** Students will also develop theoretical reasoning and knowledge for practical use. Understanding of Ancient Indian Knowledge base on strength and properties of rocks and various minerals.	
7	**Credit Value**	**6**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	Ancient Indian Knowledge base on various rocks and minerals. Concept of Stress, Stress in a body and at a point. Stress tensor. Stress in two and three dimensions, stress ellipsoid, Mohr circles, Mean and deviatoric stress. Stress invariants. Strain and its types, strain measurements, Finite and infinitesimal strain, Progressive deformation. Strain ellipsoid, strain invariants, concept of displacement and deformation gradients and strain tensor components. Activities: Group discussion, Seminar-PPT	18
II	Stress-strain relationships of Hooke anbehavior. Elastic constants. Brittle deformation. Fractures and joints, Mechanics of their origin. Geometry of faults and Faults classification. Recognition of faults. Mechanics of faulting. Fault complexes. Activities: Group discussion, Seminar-PPT	18
III	Stress-strain relationships of Newtonian behaviorin plastic and viscous materials, and effect of conditions on behavior of materials. Folds classification; Geometry of fold surfaces: Recognition of folds. Effects of folds on outcrops. Mechanics of folding. Introduction to Shear zones. Activities:	18

	Group discussion, Seminar-PPT	
IV	Lineation, their types. Relation of lineation's to other structures. Foliation, rock cleavages and schistosity. Their relationship with other major structures. Unconformities- Types and recognition. Introduction to petro-fabrics. Time-relationship between crystallization and deformation. Activities: Group discussion, Seminar-PPT	18
V	Principles of optics, Double refraction, Optical classification of minerals, Birefringence, Determination of Refractive Index, Uniaxial and Biaxial Indicatrix, Determination of pleochroic scheme, interference colors, interference figures, and Optic Sign of minerals. Physical, chemical, optical and crystallographic characteristics of the following groups (Families) –Silica, Feldspar, Pyroxene, Amphibole and Mica. Activities: Quiz, Posters, Seminar-PPT	18
	Keywords/ Tags: Stress, Mohr circles, strain, Lineation, Uniaxial and Biaxial	

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Jain A.K. : An Introduction to Structural Geology Geol soc. India

Bhattacharya A.R.: Structural Geology, Springer

Ghosh S K 1995: Structural Geology Fundamentals of Modern Developments.
Badgley P C, 1959: Structural Geology for the Exploration Geology. Harper and Bro
Bayly B 1992: Mechanics in Structural Geology. Springer-Verlag
Billings, M P : Structural Geology. 3e.
Davis G H 1984: Structural Geology of Rocks and Region. John Wiley
Fossen, H, 2016: Structural Geology. Cambridge
Hobbs, Means and Williams, 1973: An Outline of Structural Geology.Wiley
Means, W.D. (1976) Stress and Strain. Sringer-Verlag
Moore E and Twiss RJ 1995: Tectonics. Freeman Pergamon Press
Park, R G, 1988: Foundations of Structural Geology. 2e Blackie Academy
Price NJ and Cosgrove JW 1990: Analysis of Geological Structure. Cambridge Univ. P
Dana, E.S. and Ford, W.E. 2002: A textbook of Mineralogy (Reprint).
Deer, WA; Howie, RA and Zussman, J 1996: Rock forming minerals. Longman
Gribble, CD.1993: Rutley's Elements of Mineralogy.
Kerr, P.F. 1977: Optical Mineralogy, McGraw Hill.
Klein, C and Huarlbut, CS. 1993: Manual of mineralogy. John Willey.
Krauskopf, K.B. 1967: Introduction to Geochemistry, McGraw Hill.
Mason, B. and Moore, C.B. 1991: Introduction to Geochemistry, Wiley Eastern.
Moorhouse, W.W. (1951): Optical Mineralogy, Harper and Row
Perkins, D.; Mineralogy, Prentice Hall India, 3rd ed. 2012.
Phillips, WR and Griffin DT; 1986: Optical mineralogy. CBS
Rathore, B.S.; Basics of Crystallography, Mineralogy and Geochemistry. Notion Press India, 2020.
Sharma, R.S. and Sharma, Anurag; Crystallography and Mineralogy - Concepts and Methods. Geol. Soc. Ind., Bengaluru, 2013.Perkins, D. 1998: Mineralogy, Prentice Hall.
Winchell, E.N. (1951): Elements of Optical Mineralogy, Wiley Eastern.

Metals and Minerals in ancient India
http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf
https://www.exoticindiaart.com/book/details/minerals-and-mining-in-ancient-india-from-earliest-times-to-beginning-of-christian-era-uax073/rock-cut temples/sites
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks: **100**
Continuous Comprehensive evaluation (CCE): **40**
Mid Term Examination: **60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Class Test/Presentation/ Assignment/ Quiz/Debate/Poster making/Group Discussion etc.	**40**
External Assessment : Mid Term Examination	**Section(A):** Very Short Questions **Section (B):** Short Questions **Section(C):** Long Questions	**60**

Any remarks/Suggestions:

Practicum Paper: Scheme B-1 for Two Year PG Program				
Part A- Introduction				
Program: 2-Year PG	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26	
Subject: **Geology**				
1	**Course Code**	**PC12**		
2	**Course Title**	**Structural Geology and Mineralogy**		
3	**Course Type**	Practical Course		
4	**Pre-Requisite (if any)**	400		
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject		
6	**Course Learning Outcome (CLO)**	The Practicum Part will enhance the theoretical reasoning by directly exposing the students to representative samples/ models/ problems. This will help students improve the understanding of the subject **Structural Geology and Mineralogy** in totality. Indian Knowledge base on rocks and minerals		
7	**Credit Value**	4		
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40	

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	No. Of Lectures
1. 1. Study of geological maps. 2. Stereo-net Analysis of structural data. 3. Strain ellipsoid from deformed fossils. 4. Determination of longitudinal strain and shear strain on stretched belemnites and sheared brachiopod fossils 5. Determining normal and shear stresses on a plane with Mohr's diagram for given values principal stresses. 6. Determination of the style of folding according to Ramsay's classification 7. Interpretation of deformed natural samples 8. Interpretation of Wooden structural models of folds and faults 9. Megascopic study of important rock forming minerals 10. Microscopic Study of important rock forming minerals along with determination of Optic Sign, Pleochroic scheme, Birefringence, dispersion ellipsoid, extinction, indicatrix, interference figure, Optic orientation 2. Group discussions on the Indian understanding of various minerals, their trades etc.	**120 Hrs**

Keywords/ Tags: geological map, Strain ellipsoid, Mohr's diagram, Ramsay's classification, Birefringence,

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Jain A.K. : An Introduction to Structural Geology Geol soc. India

Bhattacharya A.R.: Structural Geology, Springer

Ghosh S K 1995: Structural Geology Fundamentals of Modern Developments.
Badgley P C, 1959: Structural Geology for the Exploration Geology. Harper and Bro
Bayly B 1992: Mechanics in Structural Geology. Springer-Verlag
Billings, M P : Structural Geology. 3e.
Davis G H 1984: Structural Geology of Rocks and Region. John Wiley
Fossen, H, 2016: Structural Geology. Cambridge
Hobbs, Means and Williams, 1973: An Outline of Structural Geology.Wiley
Means, W.D. (1976) Stress and Strain. Sringer-Verlag
Moore E and Twiss RJ 1995: Tectonics. Freeman Pergamon Press
Park, R G, 1988: Foundations of Structural Geology. 2e Blackie Academy
Price NJ and Cosgrove JW 1990: Analysis of Geological Structure. Cambridge Univ. P
Dana, E.S. and Ford, W.E. 2002: A textbook of Mineralogy (Reprint).
Deer, WA; Howie, RA and Zussman, J 1996: Rock forming minerals. Longman
Gribble, CD.1993: Rutley's Elements of Mineralogy.
Kerr, P.F. 1977: Optical Mineralogy, McGraw Hill.
Klein, C and Huarlbut, CS. 1993: Manual of mineralogy. John Willey.
Krauskopf, K.B. 1967: Introduction to Geochemistry, McGraw Hill.
Mason, B. and Moore, C.B. 1991: Introduction to Geochemistry, Wiley Eastern.
Moorhouse, W.W. (1951): Optical Mineralogy, Harper and Row
Perkins, D.; Mineralogy, Prentice Hall India, 3rd ed. 2012.
Phillips, WR and Griffin DT; 1986: Optical mineralogy. CBS
Rathore, B.S.; Basics of Crystallography, Mineralogy and Geochemistry. Notion Press India, 2020.
Sharma, R.S. and Sharma, Anurag; Crystallography and Mineralogy - Concepts and Methods. Geol. Soc. Ind., Bengaluru, 2013.Perkins, D. 1998: Mineralogy, Prentice Hall.
Winchell, E.N. (1951): Elements of Optical Mineralogy, Wiley Eastern.

Metals and Minerals in ancient India
http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf
https://www.exoticindiaart.com/book/details/minerals-and-mining-in-ancient-india-from-earliest-times-to-beginning-of-christian-era-uax073/rock-cut temples/sites
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Seminar/Demonstration/Assignment etc.	**40**
External Assessment : Mid Term Examination	Table work/ Experiments, Practical Record Files, Viva-Voce	**60**

Any remarks/Suggestions:

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology**			
1	**Course Code**	**CC21**	
2	**Course Title**	**Hydrogeology and Engineering Geology**	
3	**Course Type**	Core Course	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	**Course Learning Outcome (CLO)**	Students will acquire insight in the various fundamental and advance components and aspects of the subject **Hydrogeology and Engineering Geology.**Students will also develop theoretical reasoning and knowledge for practical use. Understanding of ancient Indian knowledge base on Hydrology and Engineering Geology	
7	**Credit Value**	**6**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	*Introduction to ancient Indian Knowledge of groundwater availability indicators. Ancient water harvesting methods and recharge structures. Introduction to ancient Indian constructions of dams and large reservoir and Canal networking.* Surface and subsurface distribution of water. Introductory idea to type and age of water. Hydrological cycle, precipitation and its types. Groundwater: Origin, importance, occurrences and subsurface reservoirs. Hydro-stratigraphic units. Water table contour maps. Geological factors governing the occurrence of groundwater. Porosity, permeability, specific yield, specific retention, hydraulic conductivity, and storage coefficient. Aquifers and their classification. Activities: Poster, Seminar-PPT	18
II	Groundwater flow: confined, unconfined, steady, unsteady, and radial flows. Forces causing flow. Darcy's Law. Water level fluctuations: causative factors and their measurements. Well hydraulics.Physical characteristics of groundwater quality: turbidity, colour, taste, odour, temperature and specific conductivity. Chemical characters of groundwater quality: TDS and suspended solids, pH value, hardness, heavy metals and dissolved gases. Biological characteristics. Water contaminants and pollutants Activities: Poster, Seminar-PPT	18

III	Salt water intrusion in coastal aquifers, remedial measures. Radio isotopes in hydrogeological studies. Water harvesting. Wetland management. Consumptive and conjunctive use of surface and groundwater. Concept of watershed management. Natural and artificial recharge of ground water. Activities: Poster, Seminar-PPT	18
IV	Importance of geology in civil engineering projects. Mechanical properties of rocks and soils and determination. Seismicity in India and earthquake-resistant structures. Geological investigations for river valley projects — Dams and reservoirs. Dam and its Parts. Types of dam. Geological investigations for Canals. Activities: Poster, Seminar-PPT	18
V	Tunnel: terminology and types, Geological considerations for tunneling grounds. Geological considerations for construction of highways. Bridges — types and foundation problems. Problems of groundwater in engineering projects. Activities: Poster, Seminar-PPT	18
Keywords/ Tags: Hydrological cycle, Groundwater, Darcy's Law, Wetland, earthquake		

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Vaidyanadhan R: SP-03: Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects Geol soc. India
Radhadrishna B. P : Hydrogeological Studies (Anthology) Geol soc. India
Sawkar RH: Groundwater Development and Rainwater Harvesting in Greater Bengaluru Geol soc. India
R H Sawkar, Subhajyoti Das: P-05: Integrated and Sustainable Water Management: Science and Technology Geol soc. India
Namdeo J Pawar, Raymond A Duraiswami, Subhajyoti Das: National Conference on Groundwater Resource Development and Management in Hard Rock Geol soc. India
Karanth, K R 1987: Ground Water Assessments, Development and Managements. McGraw
Raghunath, N M, 1982: Ground Water. Wiley Eastern
Subramaniam, V, 2000: Water. Kingston London Tata McGraw Hill
Gautam Mahajan: Groundwater Survey and Investigation. APH Publishing
Davis, S N and De Wiest R J M, 1966: Hydrogeology. John Wiley
Fetter, C W, 1990: Applied Hydrogeology. Merrill
Freeze, R A & Cherry J A, 1979: Ground Water. Prentice Hall
Gilman, Kevin: Hydrology and Wetland Conservation. Wiley
Todd, D K 1980: Ground Water Hydrology. John Wiley
Tolman, C F 1957: Ground Water. Tata McGraw Hill
Blyth F C H: Geology for Engineers. Arnold Ltd.
Gangopadhyay Subinoy: Engineering Geology, 2014 Oxford
Kesavulu N C: Text Book of Engineering Geology. McMillan
Khurmi R S: Fundamental of Engineering Geology. Dhanpat Rai & Sons
Krynine and Judd W R: Principles of Engineering Geology and Geotechnics. McGraw
Parbin Singh: Engineering and General Geology. Katson P House
Ramnathan R M: Engineering Geology. Anuradha Agency T N

Ancient Indian: Hydrology &Engineering Geology
https://www.youtube.com/watch?v=nrOfeVWlLh4

water management in ancient India
https://www.youtube.com/watch?v=ZNdyUWuJwtc

https://www.youtube.com/watch?v=1Tu9Tp1tgM8

Hydrology and water resources management in ancient India https://hess.copernicus.org/articles/24/4691/2020/

https://www.researchgate.net/publication/349919987_Ancient_Knowledge_of_water_and_Water_Traditions_in_India

S.K.Lal, *Rivers in Hindu Mythology and Ritual,* Delhi: Bharatiya Kala Prakashan, 2007.

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Class Test/Presentation/ Assignment/ Quiz/Debate/Poster making/Group Discussion etc.	**40**
External Assessment : Mid Term Examination	**Section(A):** Very Short Questions **Section (B):** Short Questions **Section(C):** Long Questions	**60**

Any remarks/Suggestions:

Practicum Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology**			

1	**Course Code**	**PC21**	
2	**Course Title**	**Hydrogeology and Engineering Geology**	
3	**Course Type**	Practical Course	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	**Course Learning Outcome (CLO)**	The Practicum Part will enhance the theoretical reasoning by directly exposing the students to representative samples/ models/ problems. This will help students improve the understanding of the subject **Hydrogeology and Engineering Geology** in totality. Understanding of ancient Indian practices of water resource development, small and large structures for water conservation, Dams and canal networks.	
7	**Credit Value**	4	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	No. Of Lectures
1. Study of hydrogeological properties of rocks. 2. Preparation of Water Table Contour Maps and their interpretation. 3. Chemical Analysis of water in practical and study. 4. Pumping test, time-draw down test and evolution of aquifer parameters. 5. Study of electrical resistivity sampling data. 6. Exercise on ground water exploration. 7. Determination of hydrological characteristics by using Thiems, Theis, Jecob and Cooper techniques. 8. Study of engineering properties of rocks. 9.Study of maps and models of important engineering structures on dam sites tunnels etc. 2. Group discussion on ancient Indian dams, canals, and water planning 3. Poster presentation of old water harvesting and recharge structure in India with special reference to Rajasthan. 4. Essay writing of ancient Indian water resource development and management	**120 Hrs**

Keywords/ Tags: Water Table Contour Maps , aquifer parameters, ground water exploration, Jecob and Cooper techniques

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Vaidyanadhan R: SP-03: Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects Geol soc. India
Radhadrishna B. P : Hydrogeological Studies (Anthology) Geol soc. India
Sawkar RH: Groundwater Development and Rainwater Harvesting in Greater Bengaluru Geol soc. India
R H Sawkar, Subhajyoti Das: P-05: Integrated and Sustainable Water Management: Science and Technology Geol soc. India
Namdeo J Pawar, Raymond A Duraiswami, Subhajyoti Das: National Conference on Groundwater Resource Development and Management in Hard Rock Geol soc. India
Karanth, K R 1987: Ground Water Assessments, Development and Managements. McGraw
Raghunath, N M, 1982: Ground Water. Wiley Eastern
Subramaniam, V, 2000: Water. Kingston London Tata McGraw Hill
Gautam Mahajan: Groundwater Survey and Investigation. APH Publishing
Davis, S N and De Wiest R J M, 1966: Hydrogeology. John Wiley
Fetter, C W, 1990: Applied Hydrogeology. Merrill
Freeze, R A & Cherry J A, 1979: Ground Water. Prentice Hall
Gilman, Kevin: Hydrology and Wetland Conservation. Wiley
Todd, D K 1980: Ground Water Hydrology. John Wiley
Tolman, C F 1957: Ground Water. Tata McGraw Hill
Blyth F C H: Geology for Engineers. Arnold Ltd.
Gangopadhyay Subinoy: Engineering Geology, 2014 Oxford
Kesavulu N C: Text Book of Engineering Geology. McMillan
Khurmi R S: Fundamental of Engineering Geology. Dhanpat Rai & Sons
Krynine and Judd W R: Principles of Engineering Geology and Geotechnics. McGraw
Parbin Singh: Engineering and General Geology. Katson P House
Ramnathan R M: Engineering Geology. Anuradha Agency T N

Ancient Indian: Hydrology &Engineering Geology
https://www.youtube.com/watch?v=nrOfeVWlLh4
water management in ancient India
https://www.youtube.com/watch?v=ZNdyUWuJwtc
https://www.youtube.com/watch?v=1Tu9Tp1tgM8
rock-cut temples/sites/architecture
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

1. Hydrology and water resources management in ancient India
   https://hess.copernicus.org/articles/24/4691/2020/
2. https://www.researchgate.net/publication/349919987_Ancient_Knowledge_of_water_and_Water_Traditions_in_India
3. S.K.Lal, *Rivers in Hindu Mythology and Ritual,* Delhi: Bharatiya Kala Prakashan, 2007.

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Seminar/Demonstration/Assignment etc.	**40**
External Assessment : Mid Term Examination	Table work/ Experiments, Practical Record Files, Viva-Voce	**60**

Any remarks/Suggestions:

Theory Paper: Scheme B-1 for Two Year PG Program

Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26

Subject: **Geology**

1	**Course Code**	**CC22**	
2	**Course Title**	**Economic and Fuel Geology**	
3	**Course Type**	Core Course	
4	**Course Level**	500	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	**Course Learning Outcome (CLO)**	Students will acquire insight in the various fundamental and advance components and aspects of the subject **Economic and Fuel Geology .** Students will also develop theoretical reasoning and knowledge for practical use. Understanding of Indian Knowledge base of economic deposits and fuels sources.	
7	**Credit Value**	**6**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	*Ancient Indian Ore deposits.Ancient India's status in Gold, Silver, Pb, Zn, Copper, Iron and other metal and nonmetal deposits and distant trades.* Ore genesis: processes of mineral deposit formation. Magmatic concentration, Contact metasomatism, Hydrothermal, Sedimentary, Placer, Residual, and Oxidation & Supergene enrichment and Volcano-genetic deposits. Activities: Group discussion, Posters	18
II	Mineralization associated with — (i) Ultramafic, Mafic and Acidic Rocks, (ii) greenstone belts, (iii) Komatiites, Anorthosites and Kimberlites and (iv) Submarine Volcanism; Porphyry, Skarn and Hydrothermal Mineralization. Activities: Group discussion, Posters	18
III	Stratiform and Strataboundores. Occurrence and distribution in India of Metalliferous deposits— Iron, Manganese, Aluminium, Chromium, Copper, Lead, Zinc, Gold, Silver, Indian deposits of non-metals— mica, asbestos, barytes, gypsum, graphite, apatite and beryl. Gemstones, refractory minerals used in fertilizer and cement industries. Activities: Group discussion, Posters	18
IV	Definition, origin of coal. Stratigraphy of coal measures.Industrial application of coal petrology. Preparation of Coal for Industrial Purpose (Washing), Carbonization (Coke Manufacturing), Gasification and Hydrogenation, Briquetting of Coal. Indian coal deposits. Classification of Coal. Coal Bed Methane. Activities:	18

	Group discussion, Posters	
V	Origin, migration and entrapment of natural hydorcarbons. Characters of source and reservoir rocks. Structural, stratigraphic and mixed traps. Techniques of exploration. Geographical and geological distributions of onshore and offshore petroliferous basins of India. Mineralogy and geochemistry of radioactive minerals. Instrumental techniques of detection and measurement of radioactivity. Productive Horizons in India, distribution of radioactive minerals in India. Activities: Group discussion, Posters	18
Keywords/ Tags: Ore genesis, Washing, Gasification, Coal Bed Methane, radioactive minerals		

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings :

Dhana Raju R: Handbook of Mineral Exploration and Ore Petrology: Techniques & Applications Geol soc. India
Acharyya SK, Mukhopadhyay G: Coal and Lignite Basins of India Geol soc. India
Dr HSM Prakash, Dr M Venkataswamy: KOLAR GOLD MINES A Short History of Gold Mining and its Socio-Economic Impact Geol soc. India
P Krishnamurthy: Rare Earth Element Occurrences and Deposits of India and Strategies for New Discoveries Geol soc. India
Dhana Raju R: Handbook of Geochemistry: Techniques and Applications in Mineral Exploration Geol soc. India
Singh MP 1998: Coal and Organic Petrology. Hindustan Publications ND
Bateman, 1981: Economic Mineral Deposits. Wiley
Dahlkamp F J 1993: Uranium Ore Deposits. Springer Verlag
Durance E M, 1986: Radioactivity in Geology: Principles and Applications. Ellis
Gaudin, A M, 1971: Principles of Mineral Dressing. Tata McGraw Hill
Holson G D and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub
Indian Minerals Year Book IBM (updates on www.ibm.nic.in)
Krishnaswamy, S, 1972: India's Mineral Resources. Oxford and IBH
Lewis, R S, and Clark, G.B., 1964, Elements of Mining, 3e Wiley, New York
McKinstry, Hough Exton, 1948, Mining Geology. Prentice Hall
Mookherjee, Asoke 2000: Ore Genesis - a holistic approach. Allied P
Nettleton L L, 1940: Geophysical Prospecting for Oil. McGraw Hill
North F K 1985: Petroleum Geology. Allen and Unwin
R N P, 1996: Courses in Mining Geology. Oxford/ IBH
Selley R C, 1998: Elements of Petroleum Geology. Academic Press
Tissot B P and Welt DH 1984: Petroleum Formation and Occurrence. Springer
Dahlkamp FJ 1993: Uranium Ore Deposits. Springer Verlag
Durance EM, 1986: Radioactivity in Geology: Principles and Applications. Ellis H
Holson GD and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub
Nettleton L L 1940: Geophysical Prospecting for Oil
North FK 1985: Petroleum Geology. Allen and Unwin
Selley RC, 1998: Elements of Petroleum Geology. Academic Press
Tissot BP and Welt DH 1984: Petroleum Formation and Occurrence. Springer Verlag
Satpathy, Binod Bihari (not dated). History of Science and Technology in India. DDCE/History (M.A.)/SLM/Paper.
Metals and Minerals in ancient India

http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf
Book
https://dkprintworld.com/product/minerals-and-metals-in-ancient-india-2-vols-set/?srsltid=AfmBOori9WP3JjcmeV0AwUo356QideRzYNWDH-MdePCV6y-aC2LYcLF7
https://geographyandyou.com/geoheritage-sites/zawar-worlds-oldest-zinc-mining-and-metallurgy-site
For TIN
https://os.pennds.org/archaeobib_filestore/pdf_articles/bookchapters/2015_Upadhyay.pdf

https://enrouteindianhistory.com/unearthing-a-precious-metal-gold-mining-in-ancient-india/

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment :	Class Test/Presentation/ Assignment/	**40**

Continuous Comprehensive evaluation (CCE):	Quiz/Debate/Poster making/Group Discussion etc.	
External Assessment : Mid Term Examination	**Section(A):** Very Short Questions **Section (B):** Short Questions **Section(C):** Long Questions	**60**
Any remarks/Suggestions:		

Practicum Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology**			

1	Course Code	**PC22**	
2	Course Title	**Economic and Fuel Geology**	
3	**Course Type**	Practical Course	
4	**Course Level**	500	
5	**Pre-Requisite (if any)**	After completing 3 Year Bachelor Degree with Geology Subject	
6	Course Learning Outcome (CLO)	The Practicum Part will enhance the theoretical reasoning by directly exposing the students to representative samples/ models/ problems. This will help students improve the understanding of the subject **Economic and Fuel Geology in** totality. Knowledge on Ancient Indian Deposits	
7	Credit Value	4	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	**No. Of Lectures**
1. Megascopic study of structures and fabrics of different ores and their associations; mineralogical and textural studies of common ore minerals under petrological microscope and ore microscope; exercises on the determination of reflectivity and microhardness of common ore minerals. 2. Determination of elemental composition of minerals and rocks by flame photometer and atomic absorption spectrometer; preparation of thin sections and polished sections; etching and staining. 3. Megascopic characterization of banded coals; proximate analysis of coals; completion of outcrops in the given maps and calculation of coal reserves; microscopic examination of polished coal pellets (identification of macerals in coal) 4. Megascopic and microscopic study of cores and well cuttings; study of geological maps and sections of important oilfields of India; calculation of reserves. Activities: 1. *Group discussion, Posters on Ancient Indian deposits and trades*	**120 Hrs**
Keywords/ Tags: photometer , polished coal , macerals in coal	

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings :

Dhana Raju R: Handbook of Mineral Exploration and Ore Petrology: Techniques & Applications Geol soc. India

Acharyya SK, Mukhopadhyay G: Coal and Lignite Basins of India Geol soc. India

Dr HSM Prakash, Dr M Venkataswamy: KOLAR GOLD MINES A Short History of Gold Mining and its Socio-Economic Impact Geol soc. India

P Krishnamurthy: Rare Earth Element Occurrences and Deposits of India and Strategies for New Discoveries Geol soc. India

Dhana Raju R: Handbook of Geochemistry: Techniques and Applications in Mineral Exploration Geol soc. India

Singh MP 1998: Coal and Organic Petrology. Hindustan Publications ND

Bateman, 1981: Economic Mineral Deposits. Wiley

Dahlkamp F J 1993: Uranium Ore Deposits. Springer Verlag

Durance E M, 1986: Radioactivity in Geology: Principles and Applications. Ellis

Gaudin, A M, 1971: Principles of Mineral Dressing. Tata McGraw Hill

Holson G D and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Indian Minerals Year Book IBM (updates on www.ibm.nic.in)

Krishnaswamy, S, 1972: India's Mineral Resources. Oxford and IBH

Lewis, R S, and Clark, G.B., 1964, Elements of Mining, 3e Wiley, New York

McKinstry, Hough Exton, 1948, Mining Geology. Prentice Hall

Mookherjee, Asoke 2000: Ore Genesis - a holistic approach. Allied P

Nettleton L L, 1940: Geophysical Prospecting for Oil. McGraw Hill

North F K 1985: Petroleum Geology. Allen and Unwin

R N P, 1996: Courses in Mining Geology. Oxford/ IBH

Selley R C, 1998: Elements of Petroleum Geology. Academic Press

Tissot B P and Welt DH 1984: Petroleum Formation and Occurrence. Springer

Dahlkamp FJ 1993: Uranium Ore Deposits. Springer Verlag

Durance EM, 1986: Radioactivity in Geology: Principles and Applications. Ellis H

Holson GD and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Nettleton L L 1940: Geophysical Prospecting for Oil

North FK 1985: Petroleum Geology. Allen and Unwin

Selley RC, 1998: Elements of Petroleum Geology. Academic Press

Tissot BP and Welt DH 1984: Petroleum Formation and Occurrence. Springer Verlag

Satpathy, Binod Bihari (not dated). History of Science and Technology in India. DDCE/History (M.A.)/SLM/Paper. http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf

Book

https://dkprintworld.com/product/minerals-and-metals-in-ancient-india-2-vols-set/?srsltid=AfmBOori9WP3JjcmeV0AwUo356QideRzYNWDH-MdePCV6y-aC2LYcLF7

https://geographyandyou.com/geoheritage-sites/zawar-worlds-oldest-zinc-mining-and-metallurgy-site

For TIN

https://os.pennds.org/archaeobib_filestore/pdf_articles/bookchapters/2015_Upadhyay.pdf

https://enrouteindianhistory.com/unearthing-a-precious-metal-gold-mining-in-ancient-india/

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods:

Maximum Marks:	**100**
Continuous Comprehensive evaluation (CCE):	**40**
Mid Term Examination:	**60**

Internal Assessment : Continuous Comprehensive evaluation (CCE):	Seminar/Demonstration/Assignment etc.	**40**
External Assessment : Mid Term Examination	Table work/ Experiments, Practical Record Files, Viva-Voce	**60**

Any remarks/Suggestions:

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2-Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session 2025-26**
Subject: **Geology**			

1	**Course Code**	**VAC (Employability and Entrepreneurship Skill Course)**	
2	**Course Title**	**Employability and Entrepreneurship Skill Course**	
3	**Course Type**	VAC	
4	**Pre-Requisite (if any)**	After Bachelor Degree with Geology Subject	
5	**Course Learning Outcome (CLO)**	Students will acquire insight in the various fundamental and advance components and aspects of the subject **Employability and Entrepreneurship Skill Course in the chosen field.** Students will also develop practical skill along with the theoretical reasoning and knowledge.	
6	**Credit Value**	**2**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minim Marks: 40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practicum (in hours per week): 2 Hrs per week
L-T-P: 30 Hrs

	Topics
	(A) The EESC Shall include such important of interest of the students and concerned faculty of the geology department depending upon the facilities available with the department or local industry or as per the demand of a skill and employability assessed by the student and faculty.
	OR **If student does not choose a topic from (A) than he may opt for any one of the following fields for skill development.** **(B)** The following topics suggested for here with 1. Resistivity Survey for Groundwater study theoretical knowledge practical skill development interpretation. 2. Geochemical Analysis of Groundwater. 3. GIS based data & map generation and interpretation. 4. Surveying Techniques. 5. As per the approval of the teacher in geology

Keywords/ Tags:

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Part D- Assessment and Evaluation

Suggested Continuous evaluation Methods: Maximum Marks: **100** Continuous Comprehensive evaluation (CCE): **40** Mid Term Examination: **60**		
Internal Assessment : Continuous Comprehensive evaluation (CCE):	Class Test/Presentation/ Assignment/ Quiz/Debate/Poster making/Group Discussion etc.	**40**
External Assessment : Mid Term Examination	**Section(A):** Very Short Questions **Section (B):** Short Questions **Section(C):** Long Questions	**60**
Any remarks/Suggestions:		

SCHEME B-1

M.Sc. TWO YEARS
SUBJECT: GEOLOGY (भूविज्ञान)
2 Year PG PROGRAMME

(हिंदी)

BOARD OF STUDIES IN GEOLOGY

For 2-Year PG Programme

Scheme B-1(For Courses of Science & Arts Discipline having Major Practicum Component)

Year / Semester		Course Type				Total Credits
		Courses Level	Core Courses / Dissertation	Practicum Courses	Internship/Apprenticeship / Seminar OR VAC (CHM/EESC)	
First Year	Sem-I	400 400	CC-11 6 Credits) CC-12 (6 Credits)	PC-11 (4 Credits) PC-12 (4 Credits)	Internship/Apprenticeship ***OR*** Seminar (2 Credits)	22
	Sem-II	400 500	CC-21 (6 Credits) CC-22 (6 Credits)	PC-21 (4 Credits) PC-22 (4 Credits)	VAC (CHM/EESC) (2 Credits)	22
					Note: *Students who exit at the end of 1st year shall be awarded a Postgraduate Diploma.*	
OPTION-1: Only Course Work (Applicable to all UTDs/Colleges)						
Year / Semester		Courses Level	Core Courses / Dissertation	Practicum Courses	Internship/Apprenticeship / Seminar OR VAC (CHM/EESC)	Total Credits
Second Year	Sem-III	500 500	CC-31 (6 Credits) CC-32 (6 Credits)	PC-31 (4 Credits) PC-32 (4 Credits)	Internship/Apprenticeship ***OR*** Seminar (2 Credits)	22
	Sem-IV	500 500	CC-41 (6 Credits) CC-42 (6 Credits)	PC-41 (4 Credits) PC-42 (4 Credits)	VAC (CHM/EESC)(2 Credits)	22
OPTION-2: Course Work & Research Work (Applicable to the UTDs/Colleges having research centers recognized by the University)						
Year / Semester		Courses Level	Core Courses / Dissertation	Practicum Courses	Seminar / Research thesis/Project/Patent	Total Credits
Second Year	Sem-III	500 500	CC-31 (6 Credits) CC-32 (6 Credits)	PC-31 (4 Credits) PC-32 (4 Credits)	Seminar (2 Credits)	22
	Sem-IV	-	-	-	Research thesis / Project / Patent(22 Credits)	22
OPTION-3: Only Research Work (Applicable to the UTDs/Colleges having research centers recognized by the University)						
Second Year	Sem-III	Research thesis/ Research Project / Patent(22 Credits)				22
	Sem-IV	Research thesis / Research Project / Patent(22 Credits)				22

Note: (1) UTDs/Colleges with Research Centers have the choice of running all the OPTIONS mentioned above.

(2) Students having 4-Year Under Graduate Degree (Honours / Honours with Research) are eligible for direct lateral entry in theSemester-III of 2-Year PG Programme.

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program:**2 Year PG**	Class: **M.Sc. I Semester**	**Year: 2025**	**Session:** 2025-26
विषय: भूविज्ञान			
1	**Course Code**	**CC11**	
2	**Course Title**	**Geomorphology, Geodynamics and Remote Sensing** **भूस्थलाकृति विज्ञान, भूगतिकीय एवं सुदूर संवेदन**	
3	**Course Type**	Core Course	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत	
6	**Course Learning Outcome (CLO)**	छात्र भू- स्थलाकृति विज्ञान, भू-गतिकी और सुदूर संवेदन विषय के विभिन्न मौलिक और उन्नत घटकों और पहलुओं में अंतर्दृष्टि प्राप्त करेंगे। छात्र व्यावहारिक उपयोग के लिए सैद्धांतिक तर्क और ज्ञान भी विकसित करेंगे। भारतीय नदियों और अन्य प्राकृतिक कारकों, विभिन्न भू-आकृतियों के बारे में प्राचीन भारतीय ज्ञान।	
7	**Credit Value**	6	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40

Part B : Content of the Course

Total No. Of Lectures- Tutorial-Practical (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	सौर तंत्र एवं नक्षत्रों के संबंध में प्राचीन भारतीय ज्ञान। पृथ्वी और सौर मंडल, उल्कापिंड और अंतरिक्षीय पदार्थ (extra-terrestrial materials)। पृथ्वी का ग्रहीय विकास और इसकी आंतरिक संरचना। भारतीय नदियों और भारत की प्राकृतिक प्रमुख भू- स्थलाकृतियों के बारे में प्राचीन भारतीय ज्ञान। वैदिक सरस्वती नदी। भू- स्थलाकृति विज्ञान के आधुनिक बुनियादी सिद्धांत; अपक्षय और मृदा निर्माण; मास वेस्टिंग। प्रक्रियाओं पर जलवायु का प्रभाव। अपरदन चक्रों की अवधारणा; भू-स्थलाकृति चक्र और उनकी व्याख्या; भू- स्थलाकृति विज्ञान और संरचना और लिथोलॉजी से इसका संबंध। गतिविधियाँ: पोस्टर प्रस्तुति, सेमिनार-पीपीटी	18
II	नदी भू-आकृति विज्ञान, नदी घाटी विकास - आधार स्तर और इसके प्रकार, ग्रेडेड नदी। घाटियों का वर्गीकरण। अपवाह तंत्र विन्यास और उनका महत्व। अपवाह तंत्र बेसिनका मॉर्फोमेट्रिक विश्लेषण। शुष्क क्षेत्र और पवन क्रियाकी भू- स्थलाकृति, तटीय क्षेत्र कीभू- स्थलाकृति विज्ञान, 'कार्स्ट'स्थलाकृतिऔर हिमाच्छादित पर्वतमाला और भू-आकृतियाँ। भू-आकृति मानचित्रण।	18

	पर्वतन और महादेश रचना। जियोसिंक्लाइन(भू-अभिनतियाँ) और इसके प्रकार। गतिविधियाँ: पोस्टर प्रस्तुति, सेमिनार-पीपीटी	
III	आइसोस्टैसी: अवधारणा का विकास, आइसोस्टैटिक विसंगतियाँ, आइसोस्टैटिक मॉडल। ओरोजेनी और एपिरोजेनी। जियोसिंक्लाइन और इसके प्रकार। महाद्वीपीयविस्थापन : भूवैज्ञानिक और भूभौतिकीय साक्ष्य, यांत्रिकी, वर्तमान स्थिति। महाद्वीपीय विस्थापन और ध्रुवीय भ्रमण के साक्ष्य। मध्य-महासागर की कटक, गहरे समुद्र की खाइयों, महाद्वीपीय शील्ड क्षेत्रों और पर्वत श्रृंखलाओं में गुरुत्वाकर्षण और चुंबकीय विसंगतियाँ। गतिविधियाँ:पोस्टर प्रस्तुति, सेमिनार-पीपीटी	18
IV	प्लेट टेक्टोनिक्स और समुद्र तल फैलाव की अवधारणाएँ। प्लेट सीमाओं के प्रकार और उनकी विशेषताएँ। भारतीय प्लेट की भूगतिकी। आर्क-ट्रेंच प्रणाली, ज्वालामुखी पर्वत श्रृंखला। ट्रिपल जंक्शन और उनकी स्थिरता। प्लेट गति के कारण। पृथ्वी की भूकंपीय बेल्ट। भूकंपीयता और प्लेट की गति। भारत के भूकंप क्षेत्र। गतिविधियाँ: पोस्टर प्रस्तुति, सेमिनार-पीपीटी	18
V	हवाई फोटोग्राफी और फोटोग्रामेट्री की अवधारणाएँ और सिद्धांत; परिक्रमा करने वाले उपग्रह और सेंसर सिस्टम; भारतीय उपग्रह रिमोट सेंसिंग: डेटा उत्पाद और उनकी व्याख्या। डिजिटल इमेज प्रोसेसिंग। भू-आकृति और भूमि उपयोग मानचित्रण, संरचनात्मक मानचित्रण, जल विज्ञान अध्ययन और खनिज अन्वेषण में रिमोट सेंसिंग का अनुप्रयोग। वैश्विक और भारतीय अंतरिक्ष मिशन। भौगोलिक सूचना प्रणाली (जीआईएस): सिद्धांत और अनुप्रयोग। ग्लोबल पोजिशनिंग सिस्टम (जीपीएस) - इसके अनुप्रयोग। गतिविधियाँ: पोस्टर प्रस्तुति, सेमिनार-पीपीटी	18
Keywords/ Tags: Geodynamics, Geosynclines, Mid-ocean ridges, GIS, GPS.		
Part C- Learning Resources		
Text Books, Reference Books, Other Resources		

Suggested Readings:

Merh S. S., Radhadrishna B. P.: M-42. Vedic Sarasvati – Evolutionary History of a Lost River of Northwestern India, Geol soc. India
Savinder Singh, 1998: Geomorphology. Prayag Pustak Bhawan
Pandey S N 2001: Principles and Applications of Photo Geology. New Age
Tripathi and Bajpai ed. 2000: Remote Sensing in Geosciences
Condie K C: Plate Tectonics and Crustal Evolution.
Davies, Geoffrey F. 1999: Dynamic Earth. 1e Cambridge Univ Press Gerald
Gutenburg Beno: Internal Constitution of the Earth. Dover
Hodgson, J H: Earthquake and Earth's Structures. Prentice Hall
Holmes, Doris L and Arthur: Holmes' Principles of Physical Geology. Wiley
Martin H P Bott, 1982: The Interior of the Earth. Edward Arnold
Schubert Donald L. Turcotte, 2002: Geodynamics. 2e, Cambridge Univ Press
Strahler, A N, 1971: Earth Sciences. Harper and Row
Wyllie, Peter J: The Dynamic Earth. Wiley
Wyllie, Peter J: The Way the Earth Works. Wiley
David Lang: The Earth System. Brown Publishers
Halis, J R: Applied Geomorphology.
Holmes, Doris L and Arthur Holmes, 1978: Principles of Physical Geology. Wiley
Oscar Diedrich von Engeln , 1953: Geomorphology, Systematic and Regional. McMillan
Small, R J, 1970: Study of Landforms. Cambridge
Thornbury, W D 1968: Principles of Geomorphology. Wiley
Curran P J, 1985: Principles of Remote Sensing. ELBS/Longman
Drury S A, 1987: Image Interpretation in Geology. Allen and Unwin
Jensen, J A, 2006 : Remote Sensing of the Environment. Prentice Hall
Lueder D R, 2003: Aerial Photographic Interpretation: Principles and Applications. Textbook publisher
Miller V C, 1961: Photo Geology. McGraw
Pratt, William K, 2001: Digital Image Processing PIKS Scientific Inside. J Wiley
Wolf, P R, 1974: Elements of Photogrammetry. McGraw
https://www.youtube.com/watch?v=AmWSSFP7dLU
The Chronology and Geography of Mahabharata: A ...
YouTube · Sangam Talks
https://www.youtube.com/watch?v=lDhNkbrdgsI&t=411s
Wonders of Ancient Indian Science & Technology | Dr Raj Vedam | #SangamTalks
https://www.researchgate.net/publication/237142076_Geographical_Knowledge_Of_Ancient_India
https://www.youtube.com/watch?v=BQ0w-WytFpk
geography of Ramayana

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	कक्षा परीक्षण/प्रस्तुति/असाइनमेंट/प्रश्नोत्तरी/वाद-विवाद/पोस्टर बनाना/समूह चर्चा आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	**भाग (अ):** अति लघु उत्तरीय प्रश्न **भाग (ब):** लघु उत्तरीय प्रश्न **भाग (स):** दीर्घ उत्तरीय प्रश्न	60

Practical Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2 Year PG	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26
विषय: भूविज्ञान			

1	**Course Code**	**PC11**	
2	**Course Title**	**Geodynamics, Geomorphology and Remote Sensing** **भूस्थलाकृति विज्ञान, भूगतिकीय एवं सुदूर संवेदन**	
3	**Course Type**	Practical Course प्रायोगिक पाठ्यक्रम	
	Course Level	400	
4	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत	
5	**Course Learning Outcome (CLO)**	प्रैक्टिकम भाग छात्रों को प्रतिनिधि नमूनों/मॉडलों/समस्याओं से सीधे अवगत कराकर सैद्धांतिक तर्क को बढ़ाएगा। इससे छात्रों को भू- स्थलाकृति विज्ञान, भूगतिकी और सुदूर संवेदन विषय की समग्र समझ को बेहतर बनाने में मदद मिलेगी। प्राचीन भारत की समझ, नदी प्रणालियों और पहाड़ों का ज्ञान	
6	**Credit Value**	4	
7	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	**No. Of Lectures**
तीसरे क्रम के बेसिनों का मॉर्फोमेट्रिक विश्लेषण। जल निकासी बेसिनों का मॉर्फोमेट्रिक विश्लेषण। भूभागों का मॉर्फोमेट्रिक विश्लेषण। फोटो-व्याख्या में तत्व, हवाई तस्वीरों का अध्ययन और प्रकृति, संकल्प, मोज़ाइक, प्रतीक, नाला, पैटर्न और जल निकासी विश्लेषण, छवि लंबन; पैमाने, ऊंचाई, डुबकी, ढलान, ऊर्ध्वाधर अतिशयोक्ति और छवि विरूपण का निर्धारण; इमेजरी का विस्तृत अध्ययन। जीआईएस वातावरण में क्षेत्र के मानचित्रों का डिजिटलीकरण और ओपन एक्सेस जीआईएस सॉफ्टवेयर में डिजिटल डेटा के आधार पर डेटा का उत्पादन। प्राचीन भारतीय नदियों, समुद्रों और पहाड़ों के प्रति भारतीय दृष्टिकोण।	120 Hrs

Keywords/ Tags: Morphometric analysis, drainage basins, GIS softwere

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Merh S. S., Radhadrishna B. P.: M-42. Vedic Sarasvati – Evolutionary History of a Lost River of Northwestern India, Geol soc. India

Savinder Singh, 1998: Geomorphology. Prayag Pustak Bhawan

Pandey S N 2001: Principles and Applications of Photo Geology. New Age

Tripathi and Bajpai ed. 2000: Remote Sensing in Geosciences

Condie K C: Plate Tectonics and Crustal Evolution.

Davies, Geoffrey F. 1999: Dynamic Earth. 1e Cambridge Univ Press Gerald

Gutenburg Beno: Internal Constitution of the Earth. Dover

Hodgson, J H: Earthquake and Earth's Structures. Prentice Hall

Holmes, Doris L and Arthur: Holmes' Principles of Physical Geology. Wiley

Martin H P Bott, 1982: The Interior of the Earth. Edward Arnold

Schubert Donald L. Turcotte, 2002: Geodynamics. 2e, Cambridge Univ Press

Strahler, A N, 1971: Earth Sciences. Harper and Row

Wyllie, Peter J: The Dynamic Earth. Wiley

Wyllie, Peter J: The Way the Earth Works. Wiley

David Lang: The Earth System. Brown Publishers

Halis, J R: Applied Geomorphology.

Holmes, Doris L and Arthur Holmes, 1978: Principles of Physical Geology. Wiley

Oscar Diedrich von Engeln , 1953: Geomorphology, Systematic and Regional. McMillan

Small, R J, 1970: Study of Landforms. Cambridge

Thornbury, W D 1968: Principles of Geomorphology. Wiley

Curran P J, 1985: Principles of Remote Sensing. ELBS/Longman

Drury S A, 1987: Image Interpretation in Geology. Allen and Unwin

Jensen, J A, 2006 : Remote Sensing of the Environment. Prentice Hall

Lueder D R, 2003: Aerial Photographic Interpretation: Principles and Applications. Textbook publisher

Miller V C, 1961: Photo Geology. McGraw

Pratt, William K, 2001: Digital Image Processing PIKS Scientific Inside. J Wiley

Wolf, P R, 1974: Elements of Photogrammetry. McGraw

https://www.youtube.com/watch?v=AmWSSFP7dLU

The Chronology and Geography of Mahabharata: A ...

YouTube · Sangam Talks

https://www.youtube.com/watch?v=lDhNkbrdgsI&t=411s

Wonders of Ancient Indian Science & Technology | Dr Raj Vedam | #SangamTalks

https://www.researchgate.net/publication/237142076_Geographical_Knowledge_Of_Ancient_India

https://www.youtube.com/watch?v=BQ0w-WytFpk

geography of Ramayana

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक:	100
सतत व्यापक मूल्यांकन (सीसीई):	40
मध्य सत्र परीक्षा अंक:	60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	सेमीनार / डेमोस्ट्रेशन/ असाइमेन्ट आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	टेबल वर्क / प्रयोग, प्रायोगिक रिकॉर्ड,मौखिकी परीक्षा।।	60

Theory Paper: Scheme B-1 for Two Year PG Program				
Part A- Introduction				
Program: 2 Year PG	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26	
विषय: भूविज्ञान				
1	**Course Code**	**CC12**		
2	**Course Title**	**Structural Geology and Mineralogy** संरचनात्मकभूविज्ञानऔरखनिजविज्ञान		
3	**Course Type**	Core Course: कोर कोर्स		
4	**Course Level**	400		
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत		
6	**Course Learning Outcome (CLO)**	छात्र संरचनात्मक भूविज्ञान और खनिज विज्ञान विषय के विभिन्न मौलिक और उन्नत घटकों और पहलुओं में अंतर्दृष्टि प्राप्त करेंगे। छात्र व्यावहारिक उपयोग के लिए सैद्धांतिक तर्क और ज्ञान भी विकसित करेंगे। चट्टानों और विभिन्न खनिजों की ताकत और गुणों पर प्राचीन भारतीय ज्ञान आधार की समझ।		
7	**Credit Value**	**6**		
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40	
Part B : Content of the Course				
Total No. Of Lectures- Tutorial- Practical (inhours per week): 6 **L-T-P: 90**				
Unit	**Topics**			**No. Of Lectures**
I	विभिन्न खनिजों एवं शैलों पर प्राचीन भारतीय ज्ञान का आधार। प्रतिबल की अवधारणा, एक पिंड में और एक बिंदु पर प्रतिबल । प्रतिबल टेंसर।			18

	दो और तीन आयामों में प्रतिबल, प्रतिबल दीर्घवृत्तज , मोहर वृत्त, माध्य और विचलन प्रतिबल । प्रतिबल अपरिवर्तनीय। विकृति और इसके प्रकार, विकृति माप, परिमित और अतिसूक्ष्म विकृति, प्रगतिशील विरूपण। विकृति दीर्घवृत्तज , विकृति अपरिवर्तनीय, विस्थापन और विरूपण प्रवणक (ग्रेडिएंट) और विकृति टेंसर घटकों की अवधारणा। गतिविधियाँ: समूह चर्चा, सेमिनार-पीपीटी	
II	हूकियन व्यवहार के प्रतिबल -विकृति संबंध। प्रत्यस्थता स्थिरांक। भंगुर विरूपण। फ्रैक्चर और संधि, उनकी उत्पत्ति के यांत्रिकी। भ्रंशों की ज्यामिति और भ्रंशों का वर्गीकरण। भ्रंश की पहचान। भ्रंशन की यांत्रिकी। भ्रंश काम्प्लेक्स । गतिविधियाँ: समूह चर्चा, सेमिनार-पीपीटी	18
III	प्लास्टिक और श्यान पदार्थों मेंन्यूटोनियन व्यवहार का प्रतिबल -विकृति संबंध, और पदार्थों के व्यवहार पर परिस्थितियों का प्रभाव। वलन का वर्गीकरण; वलन सतहों की ज्यामिति: वलन की पहचान। आउटक्रॉप पर वलन का प्रभाव। वलनीकरण की यांत्रिकी। शियर ज़ोन (अपरूपित क्षेत्र) का परिचय। गतिविधियाँ: समूह चर्चा, सेमिनार-पीपीटी	18
IV	लीनियेशन, उनके प्रकार। अन्य संरचनाओं से लीनियेशन का संबंध। फोलिएशन(पत्रण) , शैल क्लीवेज और शिस्टोसिटी। अन्य प्रमुख संरचनाओं के साथ उनका संबंध। विषम विन्यास- प्रकार और पहचान। पेट्रोफैब्रिक्स का परिचय। क्रिस्टलीकरण और विरूपण के बीच समय-संबंध। गतिविधियाँ: समूह चर्चा, सेमिनार-पीपीटी	18

V	प्रकाशिकी के सिद्धांत, द्वि अपवर्तन, खनिजों का ऑप्टिकल वर्गीकरण, बाईरेफ्रिंजेंस, अपवर्तक सूचकांक का निर्धारण, एकअक्षीय और द्विअक्षीय इंडिकेट्रिक्स, बहुवर्णी क्रम-योजना का निर्धारण, इंटरफेरेंस रंग, इंटरफेरेंस चित्र, और खनिजों के ऑप्टिक संकेत। निम्नलिखित समूहों (परिवारों) की भौतिक, रासायनिक, ऑप्टिकल और क्रिस्टलोग्राफिक विशेषताएँ - सिलका, फेल्डस्पार, पाइरोक्सिन, एम्फीबोल और मीका। गतिविधियाँ: प्रश्नोत्तरी, पोस्टर, सेमिनार-पीपीटी	18

Keywords/ Tags: Stress, Mohr circles, strain, Lineation, Uniaxial and Biaxial

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Jain A.K. : An Introduction to Structural Geology Geol soc. India

Bhattacharya A.R.: Structural Geology, Springer

Ghosh S K 1995: Structural Geology Fundamentals of Modern Developments.
Badgley P C, 1959: Structural Geology for the Exploration Geology. Harper and Bro
Bayly B 1992: Mechanics in Structural Geology. Springer-Verlag
Billings, M P : Structural Geology. 3e.
Davis G H 1984: Structural Geology of Rocks and Region. John Wiley
Fossen, H, 2016: Structural Geology. Cambridge
Hobbs, Means and Williams, 1973: An Outline of Structural Geology.Wiley
Means, W.D. (1976) Stress and Strain. Sringer-Verlag
Moore E and Twiss RJ 1995: Tectonics. Freeman Pergamon Press
Park, R G, 1988: Foundations of Structural Geology. 2e Blackie Academy
Price NJ and Cosgrove JW 1990: Analysis of Geological Structure. Cambridge Univ. P
Dana, E.S. and Ford, W.E. 2002: A textbook of Mineralogy (Reprint).
Deer, WA; Howie, RA and Zussman, J 1996: Rock forming minerals. Longman
Gribble, CD.1993: Rutley's Elements of Mineralogy.
Kerr, P.F. 1977: Optical Mineralogy, McGraw Hill.
Klein, C and Huarlbut, CS. 1993: Manual of mineralogy. John Willey.
Krauskopf, K.B. 1967: Introduction to Geochemistry, McGraw Hill.
Mason, B. and Moore, C.B. 1991: Introduction to Geochemistry, Wiley Eastern.
Moorhouse, W.W. (1951): Optical Mineralogy, Harper and Row
Perkins, D.; Mineralogy, Prentice Hall India, 3rd ed. 2012.
Phillips, WR and Griffin DT; 1986: Optical mineralogy. CBS
Rathore, B.S.; Basics of Crystallography, Mineralogy and Geochemistry. Notion Press India, 2020.
Sharma, R.S. and Sharma, Anurag; Crystallography and Mineralogy - Concepts and Methods. Geol. Soc. Ind., Bengaluru, 2013.Perkins, D. 1998: Mineralogy, Prentice Hall.
Winchell, E.N. (1951): Elements of Optical Mineralogy, Wiley Eastern.

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http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf
https://www.exoticindiaart.com/book/details/minerals-and-mining-in-ancient-india-from-earliest-times-to-beginning-of-christian-era-uax073/rock-cut temples/sites
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	कक्षा परीक्षण/प्रस्तुति/असाइनमेंट/प्रश्नोत्तरी/वाद-विवाद/पोस्टर बनाना/समूह चर्चा आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	**भाग (अ):** अति लघु उत्तरीय प्रश्न **भाग (ब):** लघु उत्तरीय प्रश्न **भाग (स):** दीर्घ उत्तरीय प्रश्न	60

Practical Paper: Scheme B-1 for Two Year PG Program				
Part A- Introduction				
Program: 2 Year PG	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26	
Subject: **Geology विषय: भूविज्ञान**				
1	**Course Code**	**PC12**		
2	**Course Title**	**Structural Geology and Mineralogy** संरचनात्मक भूविज्ञान और खनिज विज्ञान		
3	**Course Type**	प्रायोगिक पाठ्यक्रम		
4	**Pre-Requisite (if any)**	400		
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत		
6	**Course Learning Outcome (CLO)**	प्रैक्टिकम भाग छात्रों को प्रतिनिधि नमूनों/मॉडलों/समस्याओं से सीधे परिचित कराकर सैद्धांतिक तर्क को बढ़ाएगा। इससे छात्रों को संरचनात्मक भूविज्ञान और खनिज विज्ञान विषय की समग्र समझ को बेहतर बनाने में मदद मिलेगी। चट्टानों और खनिजों पर भारतीय ज्ञान का आधार		
7	**Credit Value**	4		
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40	

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 Hrs

Topics	**No. Of Lectures**
1. भूवैज्ञानिक मानचित्रों का अध्ययन। 2. संरचनात्मक डेटा का स्टीरियोनेट विश्लेषण। 3. विकृत जीवाश्मों से विकृति दीर्घवृत्त। 4. स्ट्रेच्ड बेलेमनाइट्स और अपरूपित ब्रेकिओपोड जीवाश्मों पर अनुदैर्ध्य विकृति और अपरूपक विकृति का निर्धारण 5. दिए गए प्रमुख प्रतिबलों के मूल्यों आधार पर मोहरवृत्त की सहायता से एक तल पर लंबवत और अपरूपक प्रतिबल घटकों का निर्धारण। 6. रामसे के वर्गीकरण के अनुसार वलनीकरण के प्रकार का निर्धारण	120 Hrs

7. प्राकृतिक नमूनों की विकृति की व्याख्या

8. वलन और भ्रंशों के संरचनात्मक वुडेनमॉडल की व्याख्या

9. शैल निर्माण करने वाले महत्वपूर्ण खनिजों का मेगास्कोपिक अध्ययन

10. ऑप्टिक साइन, प्लियोक्रोइक स्कीम, बाइरेफ्रेंसेंस, फैलाव दीर्घवृत्त, विलुप्ति, इंडिकेट्रिक्स, इंटरफेरेंस चित्र, ऑप्टिक अभिविन्यास के निर्धारण के साथ चट्टान बनाने वाले महत्वपूर्ण खनिजों का सूक्ष्म अध्ययन

2. विभिन्न खनिजों, उनके व्यापार आदि की भारतीय ज्ञान पर समूह चर्चा।

Keywords/ Tags: geological map, Strain ellipsoid, Mohr's diagram, Ramsay's classification, Birefringence,

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Jain A.K. : An Introduction to Structural Geology Geol soc. India

Bhattacharya A.R.: Structural Geology, Springer

Ghosh S K 1995: Structural Geology Fundamentals of Modern Developments.
Badgley P C, 1959: Structural Geology for the Exploration Geology. Harper and Bro
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Davis G H 1984: Structural Geology of Rocks and Region. John Wiley
Fossen, H, 2016: Structural Geology. Cambridge
Hobbs, Means and Williams, 1973: An Outline of Structural Geology.Wiley
Means, W.D. (1976) Stress and Strain. Sringer-Verlag
Moore E and Twiss RJ 1995: Tectonics. Freeman Pergamon Press
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Price NJ and Cosgrove JW 1990: Analysis of Geological Structure. Cambridge Univ. P
Dana, E.S. and Ford, W.E. 2002: A textbook of Mineralogy (Reprint).
Deer, WA; Howie, RA and Zussman, J 1996: Rock forming minerals. Longman
Gribble, CD.1993: Rutley's Elements of Mineralogy.
Kerr, P.F. 1977: Optical Mineralogy, McGraw Hill.
Klein, C and Huarlbut, CS. 1993: Manual of mineralogy. John Willey.
Krauskopf, K.B. 1967: Introduction to Geochemistry, McGraw Hill.
Mason, B. and Moore, C.B. 1991: Introduction to Geochemistry, Wiley Eastern.
Moorhouse, W.W. (1951): Optical Mineralogy, Harper and Row
Perkins, D.; Mineralogy, Prentice Hall India, 3rd ed. 2012.
Phillips, WR and Griffin DT; 1986: Optical mineralogy. CBS
Rathore, B.S.; Basics of Crystallography, Mineralogy and Geochemistry. Notion Press India, 2020.
Sharma, R.S. and Sharma, Anurag; Crystallography and Mineralogy - Concepts and Methods. Geol. Soc. Ind., Bengaluru, 2013.Perkins, D. 1998: Mineralogy, Prentice Hall.
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https://www.exoticindiaart.com/book/details/minerals-and-mining-in-ancient-india-from-earliest-times-to-beginning-of-christian-era-uax073/rock-cut temples/sites
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60		
आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	सेमीनार / डेमोस्ट्रेशन/ असाइमेन्ट आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	टेबल वर्क / प्रयोग, प्रायोगिक रिकॉर्ड,मौखिकी परीक्षा।।	60

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2 Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology विषय: भूविज्ञान**			

1	**Course Code**	**CC21**	
2	**Course Title**	**Hydrogeology and Engineering Geology** **भूजल विज्ञान एवं अभियांत्रिकी भूविज्ञान**	
3	**Course Type**	Core Course: कोर कोर्स	
4	**Course Level**	400	
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत	
6	**Course Learning Outcome (CLO)**	विद्यार्थीभूजल विज्ञान और अभियांत्रिकी भूविज्ञान विषय के विभिन्न मौलिक और उन्नत घटकों और पहलुओं में अंतर्दृष्टि प्राप्त करेंगे। छात्र व्यावहारिक उपयोग के लिए सैद्धांतिक तर्क और ज्ञान भी विकसित करेंगे। भूजल विज्ञान और अभियांत्रिकी भूविज्ञान पर प्राचीन भारतीय ज्ञान आधार की समझ	
7	**Credit Value**	**6**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	भूजल उपलब्धता संकेतकों के प्राचीन भारतीय ज्ञान का परिचय। प्राचीन जल संचयन विधियाँ और पुनर्भरण संरचनाएँ। बाँधों और बड़े जलाशयों तथा नहर नेटवर्किंग के प्राचीन भारतीय निर्माणों का परिचय। जल का सतही और अधोसतही वितरण। जल के प्रकार और आयु के बारे में परिचयात्मक विचार। जल	18

	विज्ञान चक्र, वर्षा और इसके प्रकार। भूजल: उत्पत्ति, महत्व, घटनाएँ और उपसतह जलाशय। हाइड्रो-स्ट्रेटीग्राफ़िक इकाइयाँ। जल तालिका समोच्च मानचित्र। भूजल की घटना को नियंत्रित करने वाले भूवैज्ञानिक कारक। रंध्रता, पारगम्यता, स्पेसिफिक यील्ड, स्पेसिफिक रिटेंशन, हाइड्रोलिक चालकता और भंडारण गुणांक। जलभृत और उनका वर्गीकरण। गतिविधियाँ: पोस्टर, सेमिनार-पीपीटी	
II	भूजल प्रवाह: सीमित, असीमित, स्थिर, अस्थिर और रेडियल प्रवाह। प्रवाह हेतु उत्तरदायी बल। डार्सी का नियम। जल स्तर में उतार-चढ़ाव: कारक और उनके माप। कुएँ की हाइड्रोलिक्स। भूजल गुणवत्ता की भौतिक विशेषताएँ: मैलापन, रंग, स्वाद, गंध, तापमान और विशिष्ट चालकता। भूजल गुणवत्ता के रासायनिक गुण: टीडीएस और निलंबित ठोस, पीएच मान, कठोरता, भारी धातुएँ और घुली हुई गैसें। जैविक विशेषताएँ। जल संदूषक और प्रदूषक गतिविधियाँ: पोस्टर, सेमिनार-पीपीटी	18
III	तटीय जलभृतों में खारे पानी का प्रवेश, उपचारात्मक उपाय। हाइड्रोजियोलॉजिकल अध्ययनों में रेडियो आइसोटोप। जल संचयन। आर्द्रभूमि प्रबंधन। सतही और भूजल का उपभोगात्मक और संयुक्त उपयोग। वाटरशेड प्रबंधन की अवधारणा। भूजल का प्राकृतिक और कृत्रिम पुनर्भरण। गतिविधियाँ: पोस्टर, सेमिनार-पीपीटी	18
IV	सिविल इंजीनियरिंग परियोजनाओं में भूविज्ञान का महत्व। शैलों और मृदा के यांत्रिक गुण और निर्धारण। भारत में भूकंपीयता और भूकंपरोधी संरचनाएँ। नदी घाटी परियोजनाओं के लिए भूवैज्ञानिक अन्वेषण - बाँध और जलाशय। बाँध और उसके भाग। बाँध के प्रकार। नहरों के लिए भूवैज्ञानिक जाँच। गतिविधियाँ: पोस्टर, सेमिनार-पीपीटी	18

V	सुरंग: शब्दावली और प्रकार, सुरंग हेतु क्षेत्र के लिए भूवैज्ञानिक विचार। राजमार्गों के निर्माण के लिए भूवैज्ञानिक विचार। पुल - प्रकार और नींव की समस्याएँ। इंजीनियरिंग परियोजनाओं में भूजल की समस्याएँ। गतिविधियाँ: पोस्टर, सेमिनार-पीपीटी	18
Keywords/ Tags: Hydrological cycle, Groundwater, Darcy's Law, Wetland, earthquake		

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Vaidyanadhan R: SP-03: Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects Geol soc. India
Radhadrishna B. P : Hydrogeological Studies (Anthology) Geol soc. India
Sawkar RH: Groundwater Development and Rainwater Harvesting in Greater Bengaluru Geol soc. India
R H Sawkar, Subhajyoti Das: P-05: Integrated and Sustainable Water Management: Science and Technology Geol soc. India
Namdeo J Pawar, Raymond A Duraiswami, Subhajyoti Das: National Conference on Groundwater Resource Development and Management in Hard Rock Geol soc. India
Karanth, K R 1987: Ground Water Assessments, Development and Managements. McGraw
Raghunath, N M, 1982: Ground Water. Wiley Eastern
Subramaniam, V, 2000: Water. Kingston London Tata McGraw Hill
Gautam Mahajan: Groundwater Survey and Investigation. APH Publishing
Davis, S N and De Wiest R J M, 1966: Hydrogeology. John Wiley
Fetter, C W, 1990: Applied Hydrogeology. Merrill
Freeze, R A & Cherry J A, 1979: Ground Water. Prentice Hall
Gilman, Kevin: Hydrology and Wetland Conservation. Wiley
Todd, D K 1980: Ground Water Hydrology. John Wiley
Tolman, C F 1957: Ground Water. Tata McGraw Hill
Blyth F C H: Geology for Engineers. Arnold Ltd.
Gangopadhyay Subinoy: Engineering Geology, 2014 Oxford
Kesavulu N C: Text Book of Engineering Geology. McMillan
Khurmi R S: Fundamental of Engineering Geology. Dhanpat Rai & Sons
Krynine and Judd W R: Principles of Engineering Geology and Geotechnics. McGraw
Parbin Singh: Engineering and General Geology. Katson P House
Ramnathan R M: Engineering Geology. Anuradha Agency T N

Ancient Indian: Hydrology &Engineering Geology
https://www.youtube.com/watch?v=nrOfeVWlLh4

water management in ancient India
https://www.youtube.com/watch?v=ZNdyUWuJwtc

https://www.youtube.com/watch?v=1Tu9Tp1tgM8

Hydrology and water resources management in ancient India https://hess.copernicus.org/articles/24/4691/2020/

https://www.researchgate.net/publication/349919987_Ancient_Knowledge_of_water_and_Water_Traditions_in_India

S.K.Lal, *Rivers in Hindu Mythology and Ritual,* Delhi: Bharatiya Kala Prakashan, 2007.

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	कक्षा परीक्षण/प्रस्तुति/असाइनमेंट/प्रश्नोत्तरी/वाद-विवाद/पोस्टर बनाना/समूह चर्चा आदि।	40
बाह्य मूल्यांकन अंक:	**भाग (अ):** अति लघु उत्तरीय प्रश्न	60

मध्य सत्र परीक्षा अंक:	**भाग (ब):** लघु उत्तरीय प्रश्न **भाग (स):** दीर्घ उत्तरीय प्रश्न	

Practical Paper: Scheme B-1 for Two Year PG Program				
Part A- Introduction				
Program: 2 Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26	
Subject: **Geology विषय: भूविज्ञान**				
1	**Course Code**	**PC21**		
2	**Course Title**	**Hydrogeology and Engineering Geology** **भूजल विज्ञान एवं अभियांत्रिकी भूविज्ञान**		
3	**Course Type**	प्रायोगिक पाठ्यक्रम		
4	**Course Level**	400		
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत		
6	**Course Learning Outcome (CLO)**	प्रैक्टिकम भाग छात्रों को प्रतिनिधि नमूनों/मॉडलों/समस्याओं से सीधे परिचित कराकर सैद्धांतिक तर्क को बढ़ाएगा। इससे विद्यार्थियोंको भूजल विज्ञान एवं अभियांत्रिकी भूविज्ञान विषय की समग्र समझ को बेहतर बनाने में मदद मिलेगी। जल संसाधन विकास, जल संरक्षण के लिए छोटी और बड़ी संरचनाओं, बांधों और नहर नेटवर्क की प्राचीन भारतीय की समझ।		
7	**Credit Value**	4		
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40	
Part B : Content of the Course				
Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week L-T-P: 120 Hrs				
Topics				**No. Of Lectures**

1. शैलों के जल विज्ञान गुणों का अध्ययन। 2. जल तालिका समोच्च मानचित्रों की तैयारी और उनकी व्याख्या। 3. व्यावहारिक और अध्ययन में जल का रासायनिक विश्लेषण। 4. पंपिंग परीक्षण, समय-ड्रा डाउन परीक्षण और जलभृत मापदंडों का विकास। 5. विद्युत प्रतिरोधकता नमूना डेटा का अध्ययन। 6. भूजल अन्वेषण पर अभ्यास। 7. थिएम्स, थीस, जेकोब और कूपर तकनीकों का उपयोग करके हाइड्रोलॉजिकल विशेषताओं का निर्धारण। 8. शैलों के इंजीनियरिंग गुणों का अध्ययन। 9. बांध स्थलों, सुरंगों आदि पर महत्वपूर्ण इंजीनियरिंग संरचनाओं के मानचित्रों और मॉडलों का अध्ययन। 2. प्राचीन भारतीय बांधों, नहरों और जल नियोजन पर समूह चर्चा। 3. राजस्थान के विशेष संदर्भ में भारत में पुरानी जल संचयन और पुनर्भरण संरचना का पोस्टर प्रस्तुतिकरण। 4. प्राचीन भारतीय जल संसाधन विकास और प्रबंधन पर निबंध लेखन	120 Hrs

Keywords/ Tags: Water Table Contour Maps , aquifer parameters, ground water exploration, Jecob and Cooper techniques

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Vaidyanadhan R: SP-03: Rejuvenation of Surface Water Resources of India: Potential, Problems and Prospects Geol soc. India
Radhadrishna B. P : Hydrogeological Studies (Anthology) Geol soc. India
Sawkar RH: Groundwater Development and Rainwater Harvesting in Greater Bengaluru Geol soc. India
R H Sawkar, Subhajyoti Das: P-05: Integrated and Sustainable Water Management: Science and Technology Geol soc. India
Namdeo J Pawar, Raymond A Duraiswami, Subhajyoti Das: National Conference on Groundwater Resource Development and Management in Hard Rock Geol soc. India
Karanth, K R 1987: Ground Water Assessments, Development and Managements. McGraw
Raghunath, N M, 1982: Ground Water. Wiley Eastern
Subramaniam, V, 2000: Water. Kingston London Tata McGraw Hill
Gautam Mahajan: Groundwater Survey and Investigation. APH Publishing
Davis, S N and De Wiest R J M, 1966: Hydrogeology. John Wiley
Fetter, C W, 1990: Applied Hydrogeology. Merrill
Freeze, R A & Cherry J A, 1979: Ground Water. Prentice Hall
Gilman, Kevin: Hydrology and Wetland Conservation. Wiley
Todd, D K 1980: Ground Water Hydrology. John Wiley
Tolman, C F 1957: Ground Water. Tata McGraw Hill
Blyth F C H: Geology for Engineers. Arnold Ltd.
Gangopadhyay Subinoy: Engineering Geology, 2014 Oxford
Kesavulu N C: Text Book of Engineering Geology. McMillan
Khurmi R S: Fundamental of Engineering Geology. Dhanpat Rai & Sons
Krynine and Judd W R: Principles of Engineering Geology and Geotechnics. McGraw
Parbin Singh: Engineering and General Geology. Katson P House
Ramnathan R M: Engineering Geology. Anuradha Agency T N

Ancient Indian: Hydrology &Engineering Geology
https://www.youtube.com/watch?v=nrOfeVWlLh4

water management in ancient India
https://www.youtube.com/watch?v=ZNdyUWuJwtc
https://www.youtube.com/watch?v=1Tu9Tp1tgM8
rock-cut temples/sites/architecture
https://en.wikipedia.org/wiki/Indian_rock-cut_architecture

1. Hydrology and water resources management in ancient India https://hess.copernicus.org/articles/24/4691/2020/
2. https://www.researchgate.net/publication/349919987_Ancient_Knowledge_of_water_and_Water_Traditions_in_India
3. S.K.Lal, *Rivers in Hindu Mythology and Ritual,* Delhi: Bharatiya Kala Prakashan, 2007.

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	सेमीनार / डेमोस्ट्रेशन/ असाइमेन्ट आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	टेबल वर्क / प्रयोग, प्रायोगिक रिकॉर्ड,मौखिकी परीक्षा।	60

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2 Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geologyविषय: भूविज्ञान**			
1	**Course Code**	**CC22**	
2	**Course Title**	**Economic and Fuel Geology** **आर्थिक भूविज्ञान एवं ईंधन भूविज्ञान**	
3	**Course Type**	Core Course कोर कोर्स	
4	**Course Level**	500	
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत	

6	**Course Learning Outcome (CLO)**	छात्र आर्थिक और ईंधन भूविज्ञान विषय के विभिन्न मौलिक और उन्नत घटकों और पहलुओं में अंतर्दृष्टि प्राप्त करेंगे। छात्र व्यावहारिक उपयोग के लिए सैद्धांतिक तर्क और ज्ञान भी विकसित करेंगे। आर्थिक जमा और ईंधन स्रोतों के भारतीय ज्ञान आधार की समझ।	
7	**Credit Value**	**6**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 6
L-T-P: 90

Unit	Topics	No. Of Lectures
I	प्राचीन भारतीय अयस्क निक्षेप, स्वर्ण, रजत, सीसा, जस्ता,तांबा, लौहा, और अन्य धात्विक तथा अधात्विक निक्षेपों एवं उनके दूरस्थ व्यापार में प्राचीन भारत का स्थान। अयस्क उत्पत्ति: खनिज निक्षेप निर्माण की प्रक्रियाएँ। मैग्मैटिक सांद्रीकरण, संपर्क मेटासोमैटिज्म, हाइड्रोथर्मल, अवसादी, प्लेसर, अवशिष्ट, और ऑक्सीकरण और सुपरजीन संवर्धन और ज्वालामुखी-जनित निक्षेप। गतिविधियाँ: समूह चर्चा, पोस्टर	18
II	खनिजीकरण से संबंधित - (i) अल्ट्रामैफ़िक, मैफ़िक और अम्लीय चट्टानें, (ii) ग्रीनस्टोन बेल्ट, (iii) कोमाटाइट्स, एनोर्थोसाइट्स और किम्बरलाइट्स और (iv) महासागरीय ज्वालामुखी; पोर्फिरी, स्कार्न और हाइड्रोथर्मल खनिजकरण। गतिविधियाँ: समूह चर्चा, पोस्टर	18
III	संस्तररूप और संस्तरबद्ध अयस्क। भारत में धातुयुक्त निक्षेप की उपस्थिति और वितरण - लोहा, मैंगनीज, एल्यूमीनियम, क्रोमियम, तांबा, सीसा, जस्ता, सोना, चांदी, गैर-धातुओं के भारतीय निक्षेप - अभ्रक, अभ्रक, बेराइट्स, जिप्सम, ग्रेफाइट, एपेटाइट और बेरिल। रत्न;उर्वरक और सीमेंट उद्योगों में उपयोग किए जाने वाले रिफ़्रैक्टरी खनिज। गतिविधियाँ: समूह चर्चा, पोस्टर	18

IV	परिभाषा, कोयले की उत्पत्ति। कोयले के माप की स्ट्रेटीग्राफी। कोयला पेट्रोलॉजी का औद्योगिक अनुप्रयोग। औद्योगिक उद्देश्य (धुलाई), कार्बनीकरण (कोक निर्माण), गैसीकरण और हाइड्रोजनीकरण, कोयले की ब्रिक्वेटिंग के लिए कोयले की तैयारी। भारतीय कोयला निक्षेप। कोयले का वर्गीकरण। कोल बेड मीथेन। गतिविधियाँ: समूह चर्चा, पोस्टर	18
V	प्राकृतिक हाइड्रोकार्बन की उत्पत्ति, स्थानांतरण और एंट्रैपमेंट । स्रोत और जलाशय शैलों के लक्षण। संरचनात्मक, स्ट्रेटीग्राफिक और मिश्रित ट्रैप। अन्वेषण की तकनीकें। भारत के तटवर्ती और अपतटीय पेट्रोलिफेरस बेसिनों का भौगोलिक और भूवैज्ञानिक वितरण। रेडियोधर्मी खनिजों का खनिज विज्ञान और भू-रसायन विज्ञान। रेडियोधर्मिता का पता लगाने और मापने की उपकरण आधारित तकनीकें। भारत में उत्पादक शैल-काल तल (होराइजन), भारत में रेडियोधर्मी खनिजों का वितरण। गतिविधियाँ: समूह चर्चा, पोस्टर	18
Keywords/ Tags: Ore genesis, Washing, Gasification, Coal Bed Methane, radioactive minerals		

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings :

Dhana Raju R: Handbook of Mineral Exploration and Ore Petrology: Techniques & Applications Geol soc. India

Acharyya SK, Mukhopadhyay G: Coal and Lignite Basins of India Geol soc. India

Dr HSM Prakash, Dr M Venkataswamy: KOLAR GOLD MINES A Short History of Gold Mining and its Socio-Economic Impact Geol soc. India

P Krishnamurthy: Rare Earth Element Occurrences and Deposits of India and Strategies for New Discoveries Geol soc. India

Dhana Raju R: Handbook of Geochemistry: Techniques and Applications in Mineral Exploration Geol soc. India

Singh MP 1998: Coal and Organic Petrology. Hindustan Publications ND

Bateman, 1981: Economic Mineral Deposits. Wiley

Dahlkamp F J 1993: Uranium Ore Deposits. Springer Verlag

Durance E M, 1986: Radioactivity in Geology: Principles and Applications. Ellis

Gaudin, A M, 1971: Principles of Mineral Dressing. Tata McGraw Hill

Holson G D and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Indian Minerals Year Book IBM (updates on www.ibm.nic.in)

Krishnaswamy, S, 1972: India's Mineral Resources. Oxford and IBH

Lewis, R S, and Clark, G.B., 1964, Elements of Mining, 3e Wiley, New York

McKinstry, Hough Exton, 1948, Mining Geology. Prentice Hall

Mookherjee, Asoke 2000: Ore Genesis - a holistic approach. Allied P

Nettleton L L, 1940: Geophysical Prospecting for Oil. McGraw Hill

North F K 1985: Petroleum Geology. Allen and Unwin

R N P, 1996: Courses in Mining Geology. Oxford/ IBH

Selley R C, 1998: Elements of Petroleum Geology. Academic Press

Tissot B P and Welt DH 1984: Petroleum Formation and Occurrence. Springer

Dahlkamp FJ 1993: Uranium Ore Deposits. Springer Verlag

Durance EM, 1986: Radioactivity in Geology: Principles and Applications. Ellis H

Holson GD and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Nettleton L L 1940: Geophysical Prospecting for Oil

North FK 1985: Petroleum Geology. Allen and Unwin

Selley RC, 1998: Elements of Petroleum Geology. Academic Press

Tissot BP and Welt DH 1984: Petroleum Formation and Occurrence. Springer Verlag

Satpathy, Binod Bihari (not dated). History of Science and Technology in India. DDCE/History (M.A.)/SLM/Paper.

Metals and Minerals in ancient India

http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf

Book

https://dkprintworld.com/product/minerals-and-metals-in-ancient-india-2-vols-set/?srsltid=AfmBOori9WP3JjcmeV0AwUo356QideRzYNWDH-MdePCV6y-aC2LYcLF7

https://geographyandyou.com/geoheritage-sites/zawar-worlds-oldest-zinc-mining-and-metallurgy-site

For TIN

https://os.pennds.org/archaeobib_filestore/pdf_articles/bookchapters/2015_Upadhyay.pdf

https://enrouteindianhistory.com/unearthing-a-precious-metal-gold-mining-in-ancient-india/

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक:	100
सतत व्यापक मूल्यांकन (सीसीई):	40
मध्य सत्र परीक्षा अंक:	60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	कक्षा परीक्षण/प्रस्तुति/असाइनमेंट/प्रश्नोत्तरी/वाद-विवाद/पोस्टर बनाना/समूह चर्चा आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	**भाग (अ):** अति लघु उत्तरीय प्रश्न **भाग (ब):** लघु उत्तरीय प्रश्न **भाग (स):** दीर्घ उत्तरीय प्रश्न	60

Practical Paper: Scheme B-1 for Two Year PG Program				
Part A- Introduction				
Program: 2 Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26	
Subject: **Geology विषय: भूविज्ञान**				
1	Course Code	**PC22**		
2	Course Title	**Economic and Fuel Geology** **आर्थिक भूविज्ञान एवं ईंधन भूविज्ञान**		
3	**Course Type**	प्रायोगिक पाठ्यक्रम		
4	**Course Level**	500		
5	**Pre-Requisite (if any)**	त्रिवर्षीय स्नातक पाठ्यक्रम के उपरांत		
6	Course Learning Outcome (CLO)	प्रैक्टिकम भागविद्यार्थियों को प्रतिनिधि नमूनों/मॉडलों/समस्याओं से सीधे परिचित कराकर सैद्धांतिक तर्क को बढ़ाएगा। इससे छात्रों को समग्र रूप से आर्थिक और ईंधन भूविज्ञान विषय की समझ को बेहतर बनाने में मदद मिलेगी।		
7	Credit Value	4		
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks:40	

Part B : Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 hrs per credit per week = 8 hrs of Lab per week
L-T-P: 120 hrs

Topics	**No. Of Lectures**
1. विभिन्न अयस्कों और उनकी साहचर्यस्थ संरचनाओं और संरचनाओं का मेगास्कोपिक अध्ययन; पेट्रोलॉजिकल माइक्रोस्कोप और अयस्क माइक्रोस्कोप के तहत सामान्य अयस्क खनिजों का खनिजकीय और गठनात्मक अध्ययन; सामान्य अयस्क खनिजों की परावर्तकता और सूक्ष्म कठोरता के निर्धारण पर अभ्यास। 2. फ्लेम फोटोमीटर और परमाणु अवशोषण स्पेक्ट्रोमीटर द्वारा खनिजों और शैलों केतात्विक संघटन का निर्धारण; थिन सेक्शन एवं पॉलिश्ड सेक्शन की तैयारी; एचिंग और स्टेनिंग। 3. बैंडेड कोयले का मेगास्कोपिक लक्षण का वर्णन; कोयले की एप्रॉक्सिमेट एनालिसिस; दिए गए	120 Hrs

मानचित्रों में आउटक्रॉप को पूरा करना और कोयला भंडार ज्ञात करने की गणना; पॉलिश किए गए कोयले के पैलेट्स की सूक्ष्मदर्शी परीक्षण (कोयले में मैकेरल की पहचान)

4. कोर और कुओं की कटाई का मेगास्कोपिक और सूक्ष्मदर्शी अध्ययन; भारत के महत्वपूर्ण तेल क्षेत्रों के भूवैज्ञानिक मानचित्रों और खंडों का अध्ययन; भंडार निर्धारण की गणना।

गतिविधियाँ:

1. समूह चर्चा, पोस्टर

Keywords/ Tags: photometer , polished coal , macerals in coal

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings :

Dhana Raju R: Handbook of Mineral Exploration and Ore Petrology: Techniques & Applications Geol soc. India

Acharyya SK, Mukhopadhyay G: Coal and Lignite Basins of India Geol soc. India

Dr HSM Prakash, Dr M Venkataswamy: KOLAR GOLD MINES A Short History of Gold Mining and its Socio-Economic Impact Geol soc. India

P Krishnamurthy: Rare Earth Element Occurrences and Deposits of India and Strategies for New Discoveries Geol soc. India

Dhana Raju R: Handbook of Geochemistry: Techniques and Applications in Mineral Exploration Geol soc. India

Singh MP 1998: Coal and Organic Petrology. Hindustan Publications ND

Bateman, 1981: Economic Mineral Deposits. Wiley

Dahlkamp F J 1993: Uranium Ore Deposits. Springer Verlag

Durance E M, 1986: Radioactivity in Geology: Principles and Applications. Ellis

Gaudin, A M, 1971: Principles of Mineral Dressing. Tata McGraw Hill

Holson G D and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Indian Minerals Year Book IBM (updates on www.ibm.nic.in)

Krishnaswamy, S, 1972: India's Mineral Resources. Oxford and IBH

Lewis, R S, and Clark, G.B., 1964, Elements of Mining, 3e Wiley, New York

McKinstry, Hough Exton, 1948, Mining Geology. Prentice Hall

Mookherjee, Asoke 2000: Ore Genesis - a holistic approach. Allied P

Nettleton L L, 1940: Geophysical Prospecting for Oil. McGraw Hill

North F K 1985: Petroleum Geology. Allen and Unwin

R N P, 1996: Courses in Mining Geology. Oxford/ IBH

Selley R C, 1998: Elements of Petroleum Geology. Academic Press

Tissot B P and Welt DH 1984: Petroleum Formation and Occurrence. Springer

Dahlkamp FJ 1993: Uranium Ore Deposits. Springer Verlag

Durance EM, 1986: Radioactivity in Geology: Principles and Applications. Ellis H

Holson GD and Tiratsoo E N, 1985: Introduction of petroleum Geology. Gulf Pub

Nettleton L L 1940: Geophysical Prospecting for Oil

North FK 1985: Petroleum Geology. Allen and Unwin

Selley RC, 1998: Elements of Petroleum Geology. Academic Press

Tissot BP and Welt DH 1984: Petroleum Formation and Occurrence. Springer Verlag

Satpathy, Binod Bihari (not dated). History of Science and Technology in India. DDCE/History (M.A.)/SLM/Paper.

http://eprints.nias.res.in/374/1/B8-2013%20Minerals%20and%20Metals%20Heritage%20of%20India.pdf

Book

https://dkprintworld.com/product/minerals-and-metals-in-ancient-india-2-vols-set/?srsltid=AfmBOori9WP3JjcmeV0AwUo356QideRzYNWDH-MdePCV6y-aC2LYcLF7

https://geographyandyou.com/geoheritage-sites/zawar-worlds-oldest-zinc-mining-and-metallurgy-site

For TIN

https://os.pennds.org/archaeobib_filestore/pdf_articles/bookchapters/2015_Upadhyay.pdf

https://enrouteindianhistory.com/unearthing-a-precious-metal-gold-mining-in-ancient-india/

भाग- द: आकलन और मूल्यांकन विधियाँ		
अनुशंसित सतत मूल्यांकन विधियाँ: अधिकतम अंक: 100 सतत व्यापक मूल्यांकन (सीसीई): 40 मध्य सत्र परीक्षा अंक: 60		
आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	सेमीनार / डेमोस्ट्रेशन/ असाइमेन्ट आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	टेबल वर्क / प्रयोग, प्रायोगिक रिकॉर्ड,मौखिकी परीक्षा।।	60

Theory Paper: Scheme B-1 for Two Year PG Program			
Part A- Introduction			
Program: 2 Year PG	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Geology विषय: भूविज्ञान**			
1	**Course Code**	**VAC (Employability and Entrepreneurship Skill Course)** **वीएसी (रोज़गार उन्मुख एवं उद्यमिता कौशल)**	
2	**Course Title**	**Employability and Entrepreneurship Skill Course** **रोज़गार उन्मुख एवं उद्यमिता कौशल पाठ्यक्रम**	
3	**Course Type**	VAC वी ए सी	
4	**Pre-Requisite (if any)**	After Bachelor Degree with Geology Subject स्नातक उपाधि के उपरांत	
5	**Course Learning Outcome (CLO)**	विद्यार्थी चुने हुए क्षेत्र में रोजगार और उद्यमिता कौशल पाठ्यक्रम के विषय के विभिन्न मौलिक और उन्नत घटकों और पहलुओं में अंतर्दृष्टि प्राप्त करेंगे। छात्र सैद्धांतिक तर्क और ज्ञान के साथ-साथ व्यावहारिक कौशल भी विकसित करेंगे।	
6	**Credit Value**	**2**	
8	**Total Marks**	Max. Marks: 100 (40+60)	Minimum Passing Marks: 40
Part B : Content of the Course			
Total No. Of Lectures- Tutorial- Practical (in hours per week): 2 Hrs per week **L-T-P: 30 Hrs**			
	Topics		

	(ए)ईईएससी में भूविज्ञान विभाग के छात्रों और संबंधित संकाय की रुचि के ऐसे महत्वपूर्ण विषय शामिल होंगे जो विभाग या स्थानीय उद्योग के पास उपलब्ध सुविधाओं या छात्र और संकाय द्वारा मूल्यांकन किए गए कौशल और रोजगार की मांग के अनुसार होंगे।
	OR यदि छात्र (ए) से कोई विषय नहीं चुनता है तो वह कौशल विकास के लिए निम्नलिखित क्षेत्रों(बी) में से किसी एक को चुन सकता है: (बी) यहां निम्नलिखित विषय सुझाए गए हैं 1. भूजल अध्ययन के लिए प्रतिरोधकता सर्वेक्षण सैद्धांतिक ज्ञान व्यावहारिक कौशल विकास व्याख्या। 2. भूजल का भू-रासायनिक विश्लेषण। 3. जीआईएस आधारित डेटा और मानचित्र निर्माण और व्याख्या। 4. सर्वेक्षण तकनीक। 5. भूविज्ञान के शिक्षक की अनुशंसा के अनुसार

Keywords/ Tags:

Part C- Learning Resources

Text Books, Reference Books, Other Resources

भाग- द: आकलन और मूल्यांकन विधियाँ

अनुशंसित सतत मूल्यांकन विधियाँ:

अधिकतम अंक: 100

सतत व्यापक मूल्यांकन (सीसीई): 40

मध्य सत्र परीक्षा अंक: 60

आंतरिक मूल्यांकन सतत मूल्यांकन (सीसीई) अंक :	कक्षा परीक्षण/प्रस्तुति/असाइनमेंट/प्रश्नोत्तरी/वाद-विवाद/पोस्टर बनाना/समूह चर्चा आदि।	40
बाह्य मूल्यांकन अंक: मध्य सत्र परीक्षा अंक:	**भाग (अ):** अति लघु उत्तरीय प्रश्न **भाग (ब):** लघु उत्तरीय प्रश्न **भाग (स):** दीर्घ उत्तरीय प्रश्न	60