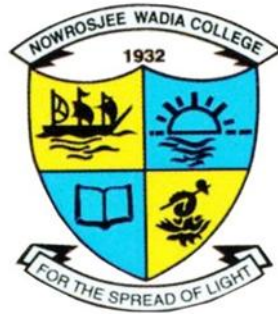


MODERN EDUCATION SOCIETY'S

NOWROSJEE WADIA COLLEGE, PUNE

**(An Autonomous College Affiliated to
Savitribai Phule Pune University)**




Framework of Syllabus For

B.SC. GEOLOGY


(Based on NEP 2.0 framework)

S.Y. B.Sc. Semester – IV


2025-26

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Major Subject		
Year - 2025	GLMJ 241 Stratigraphy and Sedimentology	Credits 2
Semester- IV		Hours 30
Course specific outcomes: Understand the principles, definition, and significance of stratigraphy, including the classification of lithostratigraphy, chronostratigraphy, and biostratigraphy. Comprehend weathering, erosion, transportation, and lithification, and their effects on sediment composition and porosity/permeability. Identify and interpret textures and primary structures such as bedding, cross-bedding, and ripple marks. Classify and understand secondary deposits (e.g., bauxite, sandstone, chemical deposits) and their sedimentary environments		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
UNIT 1	Introduction to Stratigraphy: a) Definition, principles, and historical development of stratigraphy. Concepts of uniformitarianism, stratigraphic correlation. and geological time scale. b) Stratigraphic Classification and Nomenclature: Lithostratigraphy: Formations, groups, and members. Inter-relationships between lithostratigraphic, chronostratigraphic, and biostratigraphic units. Principles of Stratigraphy: Unconformities and their significance.	7
UNIT 2	Stratigraphic Units of India a) Archaean and Proterozoic formations: Dharwar Craton, Singhbhum, Vindhyan, and Cuddapah. b) Phanerozoic stratigraphy: Gondwana, Deccan Traps.	8
UNIT 3	Sedimentary Processes and Textures a) Weathering, Erosion, and Sedimentation. Mechanical and chemical weathering. Sediment transport processes: traction, saltation, suspension. b) Compaction, cementation, and lithification. c) Textures of Sedimentary Rocks Clastic textures: Grain size, shape, sorting, and roundness. Non-clastic textures: Crystalline, oolitic, and micro-crystalline textures.	7
UNIT 4	Sedimentary Structures and Environments a) Primary Sedimentary Structures Stratification: Bedding, cross-bedding, lamination. Graded bedding and ripple marks. b) Secondary Deposits and Diagenesis	8


	<p>Residual deposits: Laterite, bauxite, and soils. Arenaceous and argillaceous deposits: Sandstones, mudstones, shales. Chemical and biochemical deposits: Carbonates, evaporites, and organic sediments.</p> <p>c) Sedimentary Environments Continental: Fluvial, lacustrine, aeolian. Transitional: Deltaic, estuarine, tidal. Marine: Shallow marine, deep marine, reef environment.</p>	
Reference	<ol style="list-style-type: none"> 1. Nichols, G. (2024). Sedimentology and Stratigraphy. Wiley-Blackwell. 2. Boggs, S. (2021). Principles of Sedimentology and Stratigraphy. Pearson Education. 3. Miall, A. D. (2020). Principles of Sedimentary Stratigraphy. Academic Press. 4. Pettijohn, F. J., & Potter, P. E. (2020). Sedimentary Rocks. Harper & Row. 5. Ramsay, J. G., & Huber, M. I. (2019). The Techniques of Modern Stratigraphy. John Wiley & Sons. 6. Tucker, M. E. (2019). Sedimentary Petrology: An Introduction to the Origin of Sedimentary Rocks. Wiley-Blackwell. 7. Judd, J. F., & Houghton, R. (2018). Sedimentology: The Study of Sedimentary Processes. Oxford University Press. 8. Selley, R. C. (2017). Applied Sedimentology. Elsevier. 9. Carroll, D. (2016). Introduction to Sedimentology. McGraw-Hill. 10. Dott, R. H., & Batten, R. L. (2015). Evolution of the Earth. WCB/McGraw-Hill. 	
Learning outcomes	<p>The course will enable students to understand the core principles of stratigraphy, including its classifications and significance in geology. They will learn about sedimentary processes such as weathering, erosion, and lithification, and their impact on rock properties like porosity and permeability. Students will also gain the ability to identify and interpret primary textures and structures in sedimentary rocks, as well as classify secondary deposits and understand their environmental contexts.</p>	

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Major Subject		
Year - 2025	GLMJ 242 Geotectonics	Credits 2
Semester- IV		Hours 30
Course specific outcomes: This course enables the students to appreciate the dynamic nature of the Earth processes. They will also be praised about the geodynamics of the lithosphere and concept of isostacy, continental drift, ocean floor spreading, plate tectonics.		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
UNIT 1	Evolution of Earth Composition of Earth Physical properties and characteristics of three spherical zones of the Earth namely crust, mantle and core.	7
UNIT 2	Structure of the Lithosphere Lithospheric-asthenospheric interactions, Concept of Lithosphere, Asthenosphere and Mesosphere. Low Velocity Zone (LVZ) Continental Crust and Oceanic Crust. Geotherms, Concept of Isostacy	8
UNIT 3	Global Tectonics Direct and Indirect observations in exploration of Earth's interior. Early crustal evolution of the Earth and Introduction to concept of Cratons, Shield, Platform with suitable Indian examples. Continental drift. Morphology of Ocean floors Ocean floor spreading; Magnetic anomalies and sea floor spreading- Mechanics and applications	7
UNIT 4	Plate Tectonics Introduction to Wilson's Cycle and Concept of plate tectonics. Characteristic features of plate boundaries Different tectonic settings on Earth: Mid Oceanic Ridges, Rift valleys and Island arcs (compressional and extensional)	8
		Total 30
Reference	<ol style="list-style-type: none"> Valdiya K.S. (2014) Making of India, Springer. Patwardhan, A.M. (2012) The dynamic Earth System, PHI Learning Pvt. Ltd., Moore E.M. and Twiss R.J. (1995) Tectonics, W. H. Freeman Condie, K.C. (1989) Plate tectonics and Crustal Evolution, Butterworth-Heinemann 	


	5. Valdiya, K.S. (1984) Aspects of Tectonics: Focus on Southcentral Asia, Tata-McGraw Hill, New Delhi, 6. Belousov, V.V. (1980) Geotectonics, Springer-Verlag Berlin Heidelberg
Learning outcomes	This course develops the concepts of plate tectonics on a global scale and analyses the physical processes responsible for the formation and destruction of the plates. The student will be introduced to the structure of the continental crust vs. oceanic crust and their geodynamic. They will also appreciate the modern concept of plate tectonics and its implications.

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Major Subject		
Year - 2025	GLMJ 243 Practical based on Stratigraphy and Sedimentology	Credits 2
Semester- IV		Hours 30
<p>Course specific outcomes: Understand the principles, definition, and significance of stratigraphy, including the classification of lithostratigraphy, chronostratigraphy, and biostratigraphy. Comprehend weathering, erosion, transportation, and lithification, and their effects on sediment composition and porosity/permeability. Identify and interpret textures and primary structures such as bedding, cross-bedding, and ripple marks. Classify and understand secondary deposits (e.g., bauxite, sandstone, chemical deposits) and their sedimentary environments.</p>		
Sr. No.	COURSE CONTENT / SYLLABUS	No. of Lectures
1	Study of Rock Specimens of Archean age (Schist, Gneiss)	1
2	Study of Rock Specimens of Purana formation (Sandstone & Limestone)	1
3	Study of Rock Specimens of Gondwana supergroup (Shale & Fossiliferous Limestone)	1
4	Study of Rock Specimens of Deccan Plateau (Compact & Vesicular Basalt)	2
5	Mark the Geographic distribution of various geological formations on Indian map	2
6	Megascopic study of Clastic Rocks (Conglomerate, Breccia)	2
7	Megascopic study of Non- Clastic Rocks (Halite, Chert)	2
8	Microscopic Study of thin sections of Sedimentary rocks (Limestone, Sandstone)	3
9	External classification of soil	1
		Total -15


Reference	<ol style="list-style-type: none"> 1. Nichols, G. (2024). Sedimentology and Stratigraphy. Wiley-Blackwell. 2. Boggs, S. (2021). Principles of Sedimentology and Stratigraphy. Pearson Education. 3. Miall, A. D. (2020). Principles of Sedimentary Stratigraphy. Academic Press. 4. Pettijohn, F. J., & Potter, P. E. (2020). Sedimentary Rocks. Harper & Row. 5. Ramsay, J. G., & Huber, M. I. (2019). The Techniques of Modern Stratigraphy. John Wiley & Sons. 6. Tucker, M. E. (2019). Sedimentary Petrology: An Introduction to the Origin of Sedimentary Rocks. Wiley-Blackwell. 7. Judd, J. F., & Houghton, R. (2018). Sedimentology: The Study of Sedimentary Processes. Oxford University Press. 8. Selley, R. C. (2017). Applied Sedimentology. Elsevier. 9. Carroll, D. (2016). Introduction to Sedimentology. McGraw-Hill. 10. Dott, R. H., & Batten, R. L. (2015). Evolution of the Earth. WCB/McGraw-Hill.
Learning outcomes	<p>The course will enable students to understand the core principles of stratigraphy, including its classifications and significance in geology. They will learn about sedimentary processes such as weathering, erosion, and lithification, and their impact on rock properties like porosity and permeability. Students will also gain the ability to identify and interpret primary textures and structures in sedimentary rocks, as well as classify secondary deposits and understand their environmental contexts.</p>


	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Vocational Skill Course		
Year - 2025	GLVSC 244 Practical based on Geotectonics	Credits 2
Semester- IV		Hours 30
<p>Course specific outcomes: This course enables the students to appreciate the practical knowledge of dynamic nature of the Earth processes. It will also be appraised about the geodynamics of the lithosphere and concept of isostasy, ocean floor spreading, continental drift and plate tectonics etc.</p>		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
1	Marking of Craton/ Mobile Belts/ Sedimentary Basins: Craton: Dharwar, Singhbhum, Bastar, Aravalli, Bundelkhand.	3
2	Mobile Belts: Eastern Ghat Mobile Belt, Satpura Fold Belt, Pandyan Mobile Belt.	1
3	Basins: Cuddapah Supergroup, Vindhyan Supergroup, Chhattisgarh Supergroup, Bhima Supergroup.	1
4	Practical related to Mid Oceanic Ridges.	1
5	Introduction to Seismic Waves. Practicals related to seismic waves and Interior of the Earth.	3
6	Practicals related to Tectonic Map.	1
7	Study of rock specimen from different tectonically active regions of India and the World.	3
8	Study of Geo-tectonical Models (Any three).	1
9	Mathematical problems related to Geotherm/Isostasy	1
		Total 15

Reference	<ol style="list-style-type: none">1. Valdiya K.S. (2014) Making of India, Springer.2. Patwardhan, A.M. (2012) The dynamic Earth System, PHI Learning Pvt. Ltd.,3. Moores E.M. and Twiss R.J. (1995) Tectonics, W. H. Freeman4. Condie, K.C. (1989) Plate tectonics and Crustal Evolution, Butterworth-Heinemann5. Valdiya, K.S. (1984) Aspects of Tectonics: Focus on Southcentral Asia, Tata-McGraw Hill, New Delhi,6. Belousov, V.V. (1980) Geotectonics, Springer-Verlag Berlin Heidelberg
Learning outcomes	The student can undertake a basic geotectonically field data and analyse the maps of various tectonically active regions of India and the World. The students can also understand and evaluate simple structural data from reports, maps and publications, participate in basic discussion in tectonics and also know how to document structural data in a written report destruction of the plates.


	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Skill Enhancement Course		
Year - 2025	GLSEC 245 Physical Geology	Credits 2
Semester- IV		Hours 30
<p>Course specific outcomes: After this lesson the students will have a knowledge of physical geology in relation to its nature and scope, the concepts of origin and evolution of topography. Acquire knowledge about the relationship of physical geology with other branches of earth science and divisions of physical geology. Will be able to explain the position of geomorphology in physical geology along with the divisions of geomorphology in relation to structural, fluvial, arid, glacial, coastal or tropical morphology. Students will have an overview of origin and methods of development of major landforms.</p>		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
UNIT 1	Introduction to Geomorphology & Weathering Introduction: - Basic concepts of Geomorphology, Definition and scope, Geomorphic agents, Geomorphic processes - exogenetic (epigene) and endogenetic (hypogene). Weathering-Physical, chemical & biological. Soil-Definition, Formation, Types of soils & Soil Profile.	7
UNIT 2	Drainage System & Fluvial Processes and their Landforms Drainage system and Types of Drainage patterns: Dendritic, Trellis, Rectangular, Radial, Centripetal, Annular & barbed. Rivers and Fluvial Landforms: - Introduction. Development of rivers. Stages of rivers –youth, mature & old: Davis concept. Geological actions: Erosion -hydraulic action, abrasion, attrition, solution. Erosional landforms and depositional landforms formed by river. Deltas-Introduction, Types of Delta, shallow and deep water delta formation.	8
UNIT 3	Wind & Glacier Processes and their Landforms Wind and Aeolian landforms: Types of wind – Breeze, Gale, Tempest, Cyclone. Geological action of wind: Wind erosion - Deflation, abrasion & attrition. Erosional landforms and Depositional landforms formed by wind . Glaciers and its landforms. Growth and movement of glaciers. Types of glaciers –Mountain or valley glaciers, Piedmont glaciers & continental ice-sheets or ice caps. . Geological action of glaciers. Erosional work by glaciers –	7

UNIT 4	<p>Plucking/ Excavation, Frost wedging & Abrasion. Erosional landforms and depositional landforms formed by glacier.</p> <p>Coastal & Groundwater Processes and their Landforms</p> <p>Oceans and Coastal Landforms: - Topography of ocean floor – continental slope, shelf, abyssal zone, mid-oceanic ridges. Geological action of oceans. Agents of coastal erosion- Waves, Tides, Currents and circulation of water. Process of marine erosion, Erosional landforms and Depositional landforms formed by ocean.</p> <p>Groundwater: Storage of groundwater – porosity, permeability, Aquifer, water table, zone of saturation. Development of typical landform of erosion and deposition of groundwater (karst topography).</p>	8
Reference	<ol style="list-style-type: none"> 1. Arthur Holmes (2016). Principles of Physical Geology–: Wiley publishers, Third edition December; ISBN- 0471072516. 2. Hugget; (2016). Fundamentals of Geomorphology by Taylor a publisher 3. Kale, V. S. and Gupta, A. (2010): Introduction to Geomorphology, Universities Press, Hyderabad 4. Tarbuck, E. J. and Lutgens, F. K. (2009): Earth Science, Prentice Hall, New Jersey 5. Singh, S. (2002): Geomorphology, Prayag Pustak Bhawan, and Allahabad. 6. Siddhartha, K., 2001. The Earth’s Dynamic Surface, Kisalaya Publications Pvt. Ltd, New Delhi. 7. Thornbury W.D.2004. Principles of Geomorphology Second Edition Paperback – 1 January CBS publishers. 	
Learning outcomes	<p>The course will provide an understanding of the conceptual and dynamic aspects of landform development. Students will also learn the relevance of applied aspects of Physical Geology in various fields.</p>	


	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Major Subject		
Year - 2025	GLCEP 246 Community Engagement and Service	Credits 2
Semester- IV		Hours 30
Course specific outcomes:		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
UNIT 1		7
UNIT 2		8
UNIT 3		7
UNIT 4		8
Reference		
Learning outcomes		

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Minor Subject		
Year - 2025	GL MN 247 Environmental Geology	Credits 2
Semester- IV		Hours 30
Course specific outcomes: Know the fundamentals of earth science as applied to the interaction between human activity and the natural environment. Understand the occurrence and availability of both surface and subsurface water resources and the role of the hydrologic cycle and pollution. Understand the role of plate tectonics in causing earthquakes and how this understanding can aid the assessment of seismic hazard.		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
UNIT 1	Introduction of Environmental Geology Interaction between human activity and the natural environment. Concepts, Objectives, and Scope of Environmental Geology; Physical, Biological, and Socio-geological Environment, Bio-geochemical cycles. Surface and subsurface water resources. Hydrogeologic cycle and pollution, point, line and area sources of pollution. Sources of water pollution (natural and man-made), Case histories related to water pollution: Minamata disease (Japan), Arsenic poisoning (West Bengal), and Fluorosis (Bhandara), Blue Baby Nitrate.	7
UNIT 2	Water Quality and Pollution Water quality parameters: temperature, dissolved oxygen, pH, conductivity, ORP, and turbidity. BIS standards. Organic and inorganic pollutants, Introduction to Air Pollution, Heavy metal pollution. Remedial measures.	8
UNIT 3	Geogenic Disaster I Definition, Types, Prediction, Natural hazard zones and impact assessment, Natural hazard zonation maps, Significance of Geology in Disaster Management Plan for Earthquakes Richter scale, Building codes and public education a) Volcanic Hazards Origin and types of volcanic activity, Nature of volcanic hazards, Prediction of volcanic eruptions, and mitigation of volcanic hazards. b) Cyclones and Floods	7

UNIT 4	<p>Introduction, definition, classification, causative factors, vulnerability, predictability (forecasting), mitigation measures, Cyclone and flood hazards in India</p> <p>Geogenic Disaster II</p> <p>Technological approaches (e.g., dams and levees) and land-use planning approaches to avoiding flood damages.</p> <p>Droughts, meteorological, agricultural and hydrologic types, mitigation of droughts. Greenhouse effect, Introduction; Major GHG: emission of CO₂; impact on global warming on human health, agriculture Introduction, causes and types of mass movements, Identification of landslides zones, control measures, avalanches and their causes, mitigation and concept of safety factor, Evaluation of technologies for landslide prevention.</p>	8
Reference	<ol style="list-style-type: none"> 1. Bird, Eric, (2000) Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore. 2. Keller, E. A., (2000) Environmental Geology. Shales E. Merrill Publishing Co., Columbus, Ohio. 3. Thornbury W. D., (1997) Principles of Geomorphology Wiley Eastern Ltd., New Delhi. 4. Selby, M.J., (1996) Earths Changing Surface. Oxford University Press UK. 5. Valdiya, K. S., (1987) Environmental Geology - Indian Context. Tata McGraw Hill New Delhi. 6. Verma, V.K., (1986) Geomorphology Earth surface processes and form. McGraw Hill. 	
Learning outcomes	<p>Articulate the interconnected and interdisciplinary nature of environmental studies; Demonstrate an integrative approach to environmental issues with a focus on sustainability, use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving; Communicate complex environmental information to both technical and non-technical audiences; Understand and evaluate the global scale of environmental problems; and reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.</p>	

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Minor Subject		
Year - 2025	GLMI 248 Practical based on Environmental Geology	Credits 2
Semester- IV		Hours 30
Course specific outcomes: This course provides Practical knowledge insights into geologic forces that cause environmental changes influencing man's activities. Also practical knowledge regarding water air coast, Mining pollution. Emphasis is placed on natural hazards and disasters caused by geologic forces.		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
1.	Water Quality Index Characterization	1
2.	Preparation of Hazard zonation maps for India: Earthquake, landslide	2
3.	Preparation of Hazard zonation maps for World: Earthquake, landslide	2
4.	Practical related to Air Quality Analysis	1
5.	Practical related Coastal vulnerability assessment	2
6.	Assessment of Mining impact on Environment	1
7.	Preparation of water contamination map of India	1
8.	Wilcox plot classification of groundwater suitability	2
9.	Determine the hydrograph along section based on TDS PH	1
10.	Determine suitability of groundwater based on TDS classification	2
		Total 15

Reference	<ol style="list-style-type: none"> 1. Bird, Eric, (2000) Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore. 2. Keller, E. A., (2000) Environmental Geology. Shales E. Merrill Publishing Co., Columbus, Ohio. 3. Thornbury W. D., (1997) Principles of Geomorphology Wiley Eastern Ltd., New Delhi. 4. Selby, M.J., (1996) Earths Changing Surface. Oxford University Press UK. 5. Valdiya, K. S., (1987) Environmental Geology - Indian Context. Tata McGraw Hill New Delhi. 6. Verma, V.K., (1986) Geomorphology Earth surface processes and form. McGraw Hill.
Learning outcomes	<p>After this completion of course student able to understand integrative approach to environmental issues with a focus on sustainability, Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving. Understand and evaluate the global scale of environmental problems; and reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.</p>

	MODERN EDUCATION SOCIETY'S Nowrosjee Wadia College, Pune (Autonomous)	Academic Year 2025-2026
	Bachelor of Science (Hons.) with research in GEOLOGY	
Geology Open Elective		
Year - 2025	GLOE 249 Rocks and Human Evolution(Practical)	Credits 2
Semester- IV		Hours 30
Course specific outcomes: This course is designed for arts faculty students to generate interest of Geology as a science within them. The course will provide them knowledge about Human Evolution and role of rocks during Human Evolution.		
Units	COURSE CONTENT / SYLLABUS	No. of Lectures
1	Study of Geological Time Scale; Completion of Geological Time Scale with major events.	1
2	Study of Igneous Rocks Granite, Syenite, Diorite, Gabroo, Dunite Pigmatite, Dolerite, Pitchstone, Rhyolite, Basalt, Pumice	3
3	Study of Sedimentary Rocks Laterite, Bauxite ,Breccia, Conglomerate, Sandstone and its varieties, Mudstone, Shale	4
4	Study of Metamorphic Rocks Slate, Phyllite, Quartzite, Marble, Schist, Gneiss, Eclogite	2
5	Stages of Human Evolution Completion of a chart showing stages of Human Evolution	1
6	Minerals used during Early Life Galena, Pyrolusite, Magnetite, Stibnite, Kyanite	2
7	Study of variety of stone tools	2
		Total 15
Reference	1.Ajit Kumar and Raj K. Varma (2019) Art Rupestre: Petroglyphs and Pictographs in Kerala 2. Brenda Flynn (2015) Complete Guide to Building with Rocks and Stones 3. Erwin Neumayer (2013) Prehistoric Rocks 4.D.A. Atwood (2012) The Rare Earth Elements - Fundamentals and applications	
Learning outcomes	Students should able to identify different rock types and their formation. They should understand stages of human evolution and correlate it with use of rocks by human.	

