VIDYASAGAR UNIVERSITY

Paschim Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE (HONOURS)

MAJOR IN GEOLOGY

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023 & NEP, 2020

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VIDYASAGAR UNIVERSITY
BACHELOR OF SCIENCE (HONOURS) MAJOR IN GEOLOGY
(under CCFUP, 2023)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. (Hons.)	1st	I	**SEMESTER-I**							
			Major-1	**GELHMJ101**	**T: Earth System Science**	**4**	**3-1-0**	**15**	**60**	**75**
			SEC	**GELSEC01**	**P: Field Geology I: Basic Field Training**	**3**	**0-0-3**	**10**	**40**	**50**
			AEC	**AEC01**	Communicative English -1 (***common for all programmes***)	**2**	**2-0-0**	**10**	**40**	**50**
			MDC	**MDC01**	Multidisciplinary Course -1 (***to be chosen from the list***)	**3**	**3-0-0**	**10**	**40**	**50**
			VAC	**VAC01**	ENVS (***common for all programmes***)	**4**	**2-0-2**	**50**	**50**	**100**
			Minor (Disc.-I)	**GELMI01**	**T: Essentials of Geology(To be taken by students of other Disciplines)**	**4**	**3-1-0**	**15**	**60**	**75**
					Semester-I Total	**20**				**400**
		II	**SEMESTER-II**							
			Major-2	**GELHMJ102**	**T: Introduction to Mineral Science P: Practical**	**4**	**3-0-1**	**15**	**60**	**75**
			SEC	**GELSEC02**	**P: Field Work I: Geological Mapping and Structural Geology**	**3**	**0-0-3**	**10**	**40**	**50**
			AEC	**AEC02**	MIL-1 (***common for all programmes***)	**2**	**2-0-0**	**10**	**40**	**50**
			MDC	**MDC02**	Multi Disciplinary Course-02 (***to be chosen from the list***)	**3**	**3-0-0**	**10**	**40**	**50**
			VAC	**VAC02**	Value Added Course-02 (***to be chosen from the list***)	**4**	**4-0-0**	**10**	**40**	**50**
			Minor (Disc.-II)	**GELMI02**	**T: Introduction to Mineralogy; P: Practical (To be taken by students of other Disciplines)**	**4**	**3-0-1**	**15**	**60**	**75**
			Summer Intern.	**CS**	Community Service	**4**	**0-0-4**	**-**	**-**	**50**
					Semester-II Total	**24**				**400**
					TOTAL of YEAR-1	**44**				**800**

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, VAC = Value Added Course; CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language, ENVS = Environmental Studies

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MAJOR (MJ)

MJ-1: Earth System Science **Credits 04**

MJ-1T: Earth System Science **Full Marks: 75**

Course contents:

Unit 1: Earth as a planet:
Introduction to various branches of Earth Science; Origin of the Universe, Solar System and its planets; Meteorites and Asteroids; Cosmic abundance of elements; Origin of Earth-atmosphere, ocean, and life.

Unit 2: Solid Earth:
Seismic waves and internal constitution of the Earth; Concept of isostasy; Earth's magnetic field; Geothermal gradient and internal heat of the Earth. Introduction to structure: Structural elements: planar and linear structures, concept of strike and dip, trend and plunge rake/ pitch.

Unit 3: Plate Tectonics:
Concept of plate tectonics, sea-floor spreading and continental drift; Plate boundaries; Earthquake and earthquake belts; Volcanoes- types, products and their distribution.

Unit 4: Hydrosphere and Atmosphere:
Atmospheric circulations; Oceanic currents, tides and waves; Concepts of eustasy.

Unit 5: Earth Surface Processes:
Weathering; erosion; mass wasting; Formation of soil, soil profile and soil types

Unit 6: Understanding Stratigraphic records:
Stratigraphy and nature of stratigraphic records; Fundamental laws of stratigraphy: laws of superposition and faunal succession, Absolute andrelative time in Geology. Unconformity and its types, recognition of unconformity. Geological time scale.

Suggested Readings:

1. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis.
2. Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.
3. Gross, M. G. (1977). Oceanography: A view of the earth.
4. Tarback, E. J. and Lutgens, F.K. (2006).Earth Science. Pearson Prentice Hall. New Jersey
5. Grotzinger, J., Jordan, T.H., Press, F and Siever, R. (2007) Understanding Earth (Fifth Edition). W. H. Freeman and company. New York.
6. Environmental Science – Earth as a Living Planet. By – Daniel B. Botkin& Edward A. Keller, John Wiley & Sons.
7. Principles of Paleontology, Raupund Stanley, Foot and Miller.

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MJ-2: Mineral Science **Credits 04 (Full Marks: 75)**

MJ-2T: Mineral Science **Credits 03**

Course contents:

UNIT – I: Crystallography

1. Elementary ideas about crystal morphology in relation to internal structures
2. Crystal parameters and Miller indices
3. Crystal symmetry and classification of crystals into point groups, space groups and crystal systems
4. Stereographic projections of symmetry elements and forms, Herman Mauguin notation
5. Concept of crystal zoning and twin laws.

UNIT – II: Rock forming minerals

1. Minerals - definition and classification, physical and chemical properties
2. Chemical classification of minerals
3. Composition of common oxides, carbonated, sulphides and sulphates and phosphates
4. Composition of common rock-forming minerals

UNIT – III: Atomic arrangements and Mineralogical structure

1. Crystal structure and its controls: bonding and coordination principles, atomic arrangement: unit cell, CCP and HCP structures.
2. Brief idea about Pauling's rules, Solid solution, Pseudomorphism and Polymorphism: elementary concept on principle types – common polymorphic forms of C, SiO2 and Al2SiO5
3. Classification of silicate groups based on structure and derivation of structural formulae based on composition.

UNIT – IV: Optical mineralogy

1. Optical behaviour of crystals – Isotropic and anisotropic minerals; Nicol prism and its principle;
2. Refractive index of minerals; Uniaxial & Biaxial minerals; Optical indicatrix of uniaxial and biaxialminerals; Birefringence, Interference colour and use of interference colour chart; Relation between crystallographic and optical axes of crystals
3. Pleochroism and pleochroic scheme; Extinction; Study of interference figures; Optic sign of uniaxial and biaxial minerals

UNIT – IV: Instrumentation Techniques in Geology: SEM, EPMA, XRF, XRD

MJ-2T: Mineral Science (Practical) **Credits 01**

1. Study of the symmetry of crystals
2. Study of physical properties of minerals in hand specimen: Olivine, Garnet, SilIimanite, Kyanite, Staurolite, Beryl, Tourmaline, Pyroxene, Actinolite, Tremolite, Hornblende, Serpentine, Talc, Muscovite, Biotite, Quartz, Alkali feldspar, Plagioclase, Nepheline, Pyrite, Chalcopyrite, Galena, Sphalerite, Graphite, Magnetite, Haematite, Fluorite, Calcite, Dolomite,Gypsum, Asbestos, Ilmenite, Chromite, Pyrolusite, Psilomelane, Bauxite

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3. Study of optical properties of common rock-forming minerals: quartz, orthoclase, microcline,plagioclase, perthite, nepheline, olivine, orthopyroxene, clinopyroxene, hornblende, staurolite, garnet,muscovite, biotite, calcite, kyenite, tourmaline, tremolite, actinolite, Sillimanite, andalusite, scapolite.

Suggested Readings:

1. Klein, C., Dutrow, B., Dwight, J., & Klein, C. (2007). The 23rd Edition of the Manual of Mineral
1. Science (after James D. Dana). J. Wiley & Sons.
2. Kerr, P. F. (1959). Optical Mineralogy.McGraw-Hill.
3. Verma, P. K. (2010). Optical Mineralogy (Four Colour). Ane Books Pvt Ltd.
4. Deer, W. A., Howie, R. A., &Zussman, J. (1992).An introduction to the rock-forming minerals (Vol. 696). London: Longman.

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MINOR (MI)

MI – 1: Essentials of Geology **Credits 04 (Full Marks: 75)**

MI – 1T: Essentials of Geology **Credits 04**

Course contents:

UNIT 1: Introduction to geology: scope, sub-disciplines and relationship with other branches of sciences.

UNIT 2: Earth in the solar system, origin Earth's size, shape, mass, density, rotational and evolutional parameters
Solar System- Introduction to Various planets - Terrestrial Planets Solar System- Introduction to Various planets - Jovian Planets

UNIT 3: Mechanical layering of the Earth: lithosphere, asthenosphere, mantle and core. Earthquake and earthquake belts: seismic waves and internal constitution of the Earth. Volcanoes and volcanism, distribution of volcanoes. Formation of core, mantle, crust, atmosphere, hydrosphere and biosphere. Convection in Earth's core and production of its magnetic field.

UNIT 4: Fundamental Earth process: Plate tectonics. Plates and plate boundaries.

UNIT 5: Weathering and Erosion. Landforms in deserts, glaciated region and river valleys.

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MI-2: Introduction to Mineralogy **Credits 04 (Full Marks: 75)**

MI-2: Introduction to Mineralogy **Credits 03** **[45L]**

Course contents:

UNIT-I: Crystals and their characters:

UNIT-II: Crystal form, face, edge, solid angle; Interfacial angle and their measurements; Crystallographic axes and angles.

UNIT-III: Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

UNIT-IV: Introduction to Mineralogy, Definition and characters of mineral;

UNIT- V: Classification of Minerals

UNIT-VI: Common physical properties of minerals; Chemical composition and diagnosticphysical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite.

MI-2: Introduction to Mineralogy (Practical) **Credits 01**

Course Outline:

1. **Crystallography:** Study of symmetry elements of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems..
2. **Mineralogy:** Study of physical properties of minerals mentioned in theory course.

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SKILL ENHANCEMENT COURSE (SEC)

SEC 1: Field Geology I- Basic Field Training **Credits 03**

SEC1P: Field Geology I- Basic Field Training **Full Marks: 50**

Course Outline:

UNIT -1:
Topographic sheet: Methods of naming. Features scale. Map reading.

UNIT -2:

1. Use of topographic sheets in field. Marking location in topographic sheet using physical features and bearing.
2. Use of GPS in field.
3. Distance, height and pace approximation in field.

UNIT- 3:
Clinometer and Brunton compass: Use of the instruments in measuring geological datain field. Techniques of measurement of orientation data in field.

UNIT- 4:

1. Recording field data in maps and notebooks.
2. Report writing.

SEC 2: Field Work I-Geological Mapping and Structural Geology **Credits 03**

SEC 2P: Field Work I-Geological Mapping and Structural Geology **Full Marks: 50**

Course Outline:

UNIT-1:
Identification of lithological units and preparation of geological map of a small area

UNIT-2:
Field report

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