

REVISED UG SYLLABUS UNDER CBCS

(Implemented from Academic Year 2020-21)

PROGRAMME: FOUR YEAR B.Sc.,

Domain Subject: Geology

Skill Enhancement Courses (SECs) for Semester V, from 2022-23

(Syllabus-Curriculum)

Structure of SECs for Semester – V

(To choose One pair from the Four alternate pairs of SECs)

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6A	Stratigraphy	3	25	75	3	3	50	2
	7A	Indian Geology	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6B	Economic Geology	3	25	75	3	3	50	2
	7B	Mineral Economics	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6C	Paleontology	3	25	75	3	3	50	2
	7C	Adv. Micro Paleontology	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6D	Hydrogeology	3	25	75	3	3	50	2
	7D	Watershed Management	3	25	75	3	3	50	2

Note-1: For Semester–V, for the domain subject Botany, any one of the four pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D & 7D. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

Note-2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Course Outcomes:: Department of Geology

Sl. No.	Year	Subject Code	Subject Name	Course Outcome Code	Course Outcome
1.	2021		6A Stratigraphy		Students will understand rock sequences with their age, stratigraphic successions of world
2.	2021		7A Indian Geology		Students will understand rock sequences with their age, stratigraphic successions of India
3.	2021		6B Economic Geology		Student acquire knowledge on origion of economic minerals and their distribution.
4.	2021		7B Mineral Economics		By the end of the course students will get the knowledge of assessment of mineral resources and National Mineral Policy.
5.	2021		6C Palaeontology		Students will understand methods of fossil preservation and preparation and fossils records recognize and properly describe new species of fossils the stratigraphic distribution of fossils, how to estimate true times of origination and extinction, and how to estimate rates of evolution and extinction using fossils
6.	2021		7C Advanced Palaeontology		Students to gain knowledge on microfossils and their uses.
7.	2021		6D Hydrology		Students will recognize and be able to demonstrate of the hydrologic cycle as it pertains to ground water systems. Students are able to explain how different subsurface materials influence fluid flow including understanding of aquifers, aquitards, aquicludes, confined aquifers and unconfined aquifers. Using data obtained from well or piezometer tests students acquire the skills to predict parameters of ground water flow (direction, rate).

					<p>Students demonstrate understanding of surface water and ground water systems using the theories of hydraulically connected systems to predict the influence of pumping wells on availability of water in surface bodies.</p> <p>Students use the mathematical concepts that govern ground water flow to predict direction and rate of travel for ground water contaminations plumes.</p>
8.	2021		7D Watershed Management		<p>Students will understand about the prevention of soil runoff, regeneration of natural vegetation, rain water harvesting and recharging of the groundwater table.</p>

Paper 6A Stratigraphy

Unit 1: Introduction & Concepts

Definition of Stratigraphy, Scope, stratigraphic terminology. Fundamentals of litho-, bio- and chrono-stratigraphy Introduction to concepts of dynamic stratigraphy (chemostratigraphy, seismic stratigraphy, sequence stratigraphy, magnetostratigraphy)

Unit 2: Physiographic Divisions of India

Brief introduction to the physiographic and tectonic subdivisions of India – Extra Peninsular, Indo-Gangetic Alluvial Plains, Peninsula.

Unit 3: Geological Time Scale and Facies

Evolution of Geological Time Scale. Significant events in geological time scale - Significant events in geological time scale. development of a standardized stratigraphic nomenclature.

Unit 4: Facies Concept

Facies concept in stratigraphy. Walther's Law of Facies. Concept of Uniformitarianism

Unit 5: Palaeogeography and Palaeoclimate

Concept of palaeogeography and paleoclimate. Concept of paleogeographic reconstruction. Completeness and incompleteness of Stratigraphic records. Correlation, unconformities and principles of crosscutting relationship.

Reference Books:

1. Fundamentals of historical Geology and Stratigraphy of India – Ravindra Kumar
2. Principles of Stratigraphy - Lemon, R.R
3. Principles of Sedimentology and Stratigraphy - Boggs, S.
4. Principles of Stratigraphy - Danbar, C.O. and Rodgers, J.
5. Geology of India and Burma by M.S. Krishnan
6. Geology of India by D.N. Waldiya
7. Geology of India by M. Ramakrishna & R. Vidyanadhan

PRACTICALS: STRATIGRAPHIC PRINCIPLES AND INDIAN STRATIGRAPHY

Preparation of Lithostratigraphic maps of India showing distribution of important geological formations.

Study of geological map of India and identification of major Precambrian stratigraphic units.

Drawing of various paleogeographic maps of Precambrian time

Study of different Proterozoic and Pangea supercontinent reconstructions.

7A Indian Geology

Unit 1: Introduction

Indian Shield, Study of following Pre-Cambrian successions: Dharwars, Archeans.

Unit 2: Proterozoic basins of India

Geology of Cuddapah, Kurnool, Vidhyan and Delhi basins of India.

Unit 3: Palaeozoic stratigraphy of India

Stratigraphy, structure and economic importance of Gondwanas. Deccan Traps,

Unit 4: Mesozoic stratigraphy of India

a. Triassic successions of Spiti, b. Jurassic of Kutch, c. Cretaceous of Tiruchinapalli and Siwaliks.

Unit 5: Stratigraphic boundaries

Important Stratigraphic boundaries in India - a. Precambrian-Cambrian boundary, b. Permian-Triassic boundary, and c. Cretaceous-Tertiary boundary

Suggested Readings:

1. Krishnan, M. S. (1982) Geology of India and Burma, CBS Publishers, Delhi
2. Doyle, P. & Bennett, M. R. (1996) Unlocking the Stratigraphic Record. John Wiley
3. Ramakrishnan, M. & Vaidyanadhan, R. (2008) Geology of India Volumes 1 & 2, Geological society of India, Bangalore.
4. Valdiya, K. S. (2010) The making of India, Macmillan India Pvt. Ltd

Practicals:

1. Study of geological map of India and identification of major stratigraphic units.
2. Study of rocks in hand specimens from known Indian stratigraphic horizons
3. Drawing various paleogeographic maps of Precambrian time
4. Study of different Proterozoic supercontinent reconstructions.

6B Economic Geology

Unit 1: Definition and Scope

Ore genesis: Concept of ore and ore deposits; ore minerals and gangue minerals.
Metallogenic epochs and provinces.

Unit 2: Process of ore genesis

Magmatic, Metasomatism, Contact metamorphism, Hydrothermal, Residual and mechanical concentration, supergene sulphide enrichment, metamorphism.

Unit 3: Origin and mode of occurrence

Metallic, non-metallic minerals, coal, hydrocarbons and their distribution in India.

Unit 4: Genesis and distribution

Industrial minerals in India: Abrasive, cement, ceramic, glass, fertilizers&chemicals, insulators.

Unit 5: Atomic Minerals

Atomic minerals; Uranite, pitchblende, coffenite-Beachsands; monazite, Ilmenite, rutile and zircon and their use. Mineral resources of Andhra Pradesh

Suggested Readings

1. Economic mineral deposits – Bateman, A.M. and Jenson, M.C.
2. Indian Mineral resources-Krishna Swamy
3. Ore deposits of India-Gokhale and Rao

Practicals:

Study of ore minerals in hand specimens: preparation of maps showing distribution of important metallic, non-metallic, coal and oil field of India.

6B Mineral Economics

Unit 1: Introduction:

Classification of Mineral deposits – Strategic, critical and essential minerals. Mineral Concession Rules, Mineral conservation and substitution. Conservation of strategic mineral resources with special reference to India. Status of mineral production in India.

Unit 2: Sampling Techniques and Mineral Policy

Sampling: Definition, purpose, scope, common methods of sampling, types of samples, errors in sampling. Economic importance of mineral industry, special features of mineral industry, demand and supply analysis, National Mineral Policy.

Unit 3: Reserve Estimation

Estimation of reserves: Classification of reserves, tenor, grade. Statistical methods and mineral/ore deposit modelling for prospecting and exploration. Methods of resource evaluation and reserve calculation, property valuation. Treatment and marketing of ores

Unit 4: Geostatistics

Data in Earth Sciences – Classification – Tabulation. Quantitative techniques – Central tendency and dispersion, correlation and regression, Analysis of on way variance.

Unit 5: Marine Mineral Resources

Origin, occurrence and distribution with detailed description of Marine Mineral Resources, Law of Sea.

Suggested Readings

1. Fundamentals of Mathematical statistics – Gupta, S.C. and Kapoor, V.K.
2. Statistical Methods – Snedeca, G.W. and Loncron, W.G.

Practicals

Calculation of standard deviation, mean, median, mode, correlation, regression, theoretical distribution and analysis of one way variance.

6C Palaeontology

Unit – I: Introduction

Concept of species – Nomenclature – Life through Geological Time Scale – Taphonomy – Definition of fossil – Modes of preservation of fossils – Index fossil – Zone fossil.

Unit – II: Classification

Morphology, classification and evolutionary trends of Graptolites, Corals, Trilobites and Brachiopods.

Unit – III: Evolutionary trends

Morphological and evolutionary trends of Mollusks (Lamellibranches, Gastropods and Cephalopods), Echinoderms – Palaeobotany, Plant fossils.

Unit – IV: Origin and Distribution

Vertebrates Origin of vertebrates and major steps in vertebrate evolution. Mesozoic reptiles with special reference to origin diversity and extinction of dinosaurs. Evolution of horse and intercontinental migrations. Human evolution.

Unit V: Palaeobotany, Palaeoecology

Introduction to Paleobotany, Gondwana Flora. Sequence stratigraphy, Role of fossils in sequence stratigraphy. Paleocology – fossils as a window to the evolution of ecosystems.

Suggested Readings

1. Raup, D. M., Stanley, S. M., Freeman, W. H. (1971) Principles of Paleontology
2. Clarkson, E. N. K. (2012) Invertebrate paleontology and evolution 4th Edition by Blackwell Publishing.
3. Benton, M. (2009). Vertebrate paleontology. John Wiley & Sons.
4. Shukla, A. C., & Misra, S. P. (1975). Essentials of paleobotany. Vikas Publisher
5. Armstrong, H. A., & Brasier, M.D. (2005) Microfossils. Blackwell Publishing.

Practicals:

Study of fossils showing various modes of preservation Study of diagnostic morphological characters, systematic position, stratigraphic position and age of various invertebrate, vertebrate and plant fossils.

7C Advanced Micropalaeontology

Unit – I: Introduction

Definition and significance as geological record – Classification of Micro paleontology – Plant microfossils – Animal microfossils - Index fossils.

Unit – II: Detailed study and distribution

Calcareous microfossils – Phosphatic microfossils – Siliceous microfossils – Organic microfossils.

Unit – III: Significance

Detailed study and significance of Polynomorphs – Pollenrain – Plant Spores – Fungal spores – Chiinozoa – Acritarchs – Archean cells.

Unit – IV: Mineralized Microfossils

Detailed study and significance of mineralized microfossils – Ostracods – Conodonts – Sebecodonts – Cloudinids – Dinoflagellate cysts – Sponge spicules

Unit V: Applications

Applications of micropaleontology in the fields of biostratigraphy, palaeoenvironments, petroleum geology and palaeoceanography.

Suggested Readings

1. “Applied Micropalaeontology” by J M Jenkins
2. “Micropaleontology: Principles and Applications” by M S Srinivasan and Pratul Kumar Saraswati
3. “Micropaleontology: Application of Stratigraphy and Paleocyanography” by Devesh K Sinha
4. “Micropaleontology” by Gandhi M Suresh
5. “Elements of Micropalaeontology” by Gérard Bignot

Practicals:

Identification of Microfossils using Microscope

6D Hydrogeology

Unit – I: Introduction

Types of water - meteoric, juvenile, magmatic and sea water; Hydrological Cycle and its components; Water balance; Water-bearing properties of rocks - porosity, permeability, specific yield and specific retention; Vertical distribution of water; Zone of aeration and zone of saturation; Classification of rocks according to their water-bearing properties.

Unit – II: Classification

Aquifers; Classification of aquifers; Concepts of drainage basins and groundwater basins; Aquifer parameters- transmissivity and storage coefficient; Water table and piezometric surface; Fluctuations of water table and piezometric surface; Barometric and tidal efficiencies; Water table contour maps; Hydrographs; Springs; Geologic and geomorphic controls on groundwater.

Unit – III: Groundwater Provinces

Hydrostratigraphic units; Groundwater provinces of India. Hydrogeology of arid zones of India; Hydrogeology of wet lands. Theory of groundwater flow; Darcy's law and its applications; Determination of permeability in laboratory and in field; Flow through aquifers; steady, unsteady and radial flow conditions; Evaluation of aquifer parameters of confined, semi-confined and unconfined aquifers

Unit – IV: Methods of Exploration

Geologic and hydrogeologic methods of exploration; Role of remote sensing in groundwater exploration; Hydrogeomorphic and lineament mapping; Surface geophysical methods - seismic, gravity, geo-electrical and magnetic methods; Types of water wells and methods of construction; Design, development, maintenance and revitalization of wells; Sub-surface geophysical methods; Yield characteristics of wells; Pumping tests- methods, data analysis and interpretation

Unit V: Properties

Physical and chemical properties of water; Quality criteria for different uses; Graphical presentation of groundwater quality data; Groundwater quality in different provinces in India; Groundwater contamination; natural (geogenic) and anthropogenic contaminants; Saline water intrusion; Radioisotopes in hydrogeological studies.

Suggested Readings

1. "Groundwater Hydrology" by D K Todd
2. "Groundwater and Wells" by F G Driscoll
3. "Groundwater" by H M Raghunath
4. "Groundwater in Hydrosphere" by H S Nagabhushaniah

Practicals

Measurement of Physico-chemical properties of groundwater – Turbidity, Total Suspended Solid (TSS), Electrical Conductivity (EC), Total Dissolved Solids (TDS), salinity, chloride, Dissolved Oxygen (DO), pH

7D Watershed Management

Unit – I: Introduction

Watershed : Definition, scope, characteristics and classification. Topography, Channel Networks, Geomorphology and Soils.

Unit – II: Characteristics

Vegetation and Land use Land Cover. Aquifers and derivation of aquifer parameters. Evaluation of aquifer characteristics. Soil and Water conservation: Soil and soil erosion controlling measures on waste lands and agricultural lands and forests.

Unit – III: Water Harvesting

Rain water harvesting, soil moisture conservation, Rain Water Harvesting Structures. Artificial Recharge Programmes - Bhungroo.

Unit – IV: Integrated Approach

Integrated approach for sustainable development. Geospatial techniques for ground water studies and land form analysis.

Unit V: Appraisal

Participatory Rural Appraisal (PRA): Basic principles, assumptions, important types and benefits. Case studies - Ralegaon Siddhi.

Suggested Readings

1. Ground water flow and mass transport modeling for Assesment and Management of Aquifers by K.Palanisami, M.Thangarajan, and A.K.Sinha
2. Hydrology and watershed management, JNTU, by B.Venkateswara Rao, G.Jaganmohan Das, C.Sarala and M.V.S.S.Girdhar
3. Engineering Hydrology by K.Subramanyam, Tata McGraw Hill, New Delhi.

Practicals:

Preparation of Watershed maps using Toposheet by visual interpretation technique.