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)

<table>
<thead>
<tr>
<th>Univ. Code</th>
<th>Course 6&amp;7</th>
<th>Name of the Course</th>
<th>Th. Hrs. / Week</th>
<th>IE Marks</th>
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<th>Credits</th>
<th>Prac. Hrs./ Wk</th>
<th>Marks</th>
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</tr>
</thead>
<tbody>
<tr>
<td>6A</td>
<td>Stratigraphy</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7A</td>
<td>Indian Geology</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
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<tbody>
<tr>
<td>6B</td>
<td>Economic Geology</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7B</td>
<td>Mineral Economics</td>
<td>3</td>
<td>25</td>
<td>75</td>
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<tbody>
<tr>
<td>6C</td>
<td>Paleontology</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7C</td>
<td>Adv. Micro Paleontology</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
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<tbody>
<tr>
<td>6D</td>
<td>Hydrogeology</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7D</td>
<td>Watershed Management</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>2</td>
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</tbody>
</table>

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

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

| 8. | 2021 | 7D Watershed Management | Students will understand about the prevention of soil runoff, regeneration of natural vegetation, rain water harvesting and recharging of the groundwater table. |
Paper 6A Stratigraphy

Unit 1: Introduction & Concepts


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


Unit 4: Facies Concept


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
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.
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

Unit 5: Stratigraphic boundaries

Suggested Readings:

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:


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: Geostastics

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

Unit 5: Marine Mineral Resources


Suggested Readings

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


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


Unit V: Palaeobotany, Palaeoecology

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

Suggested Readings

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 microfissils – Animal microfossils - Index fossils.

Unit – II: Detailed study and distribution


Unit – III: Significance


Unit – IV: Mineralized Microfossils

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

Unit V: Applications

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

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 Paleoceanography” 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 'napping'; 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 hydroteological 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


Unit – III: Water Harvesiting


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


Practicals:

Preparation of Watershed maps using Toposheet by visual interpretation technique.