B.Sc. I year Environmental Science
Semester I and II

Gondwana University, Gadchiroli
Semester Pattern Syllabus for
B. Sc. I year, Semester I and II
Environmental Science
General Instructions

- The examination of Semester I shall comprise of two theory papers of 3 hours duration of 50 marks each. Ten marks will be allotted for internal assessment for each theory paper.
- The examination of Semester II shall comprise of two theory papers of 3 hours duration of 50 marks each. Ten marks will be allotted for internal assessment for each theory paper.
- Practical examination will be of 5 hours duration and separately for each semester having 30 marks each.
- Students should pass separately in Theory and Practical Examination.
- The syllabus is based on 6 theory periods and 6 practical periods per week.

<table>
<thead>
<tr>
<th>Distribution of Practical Marks (Semester I and II)</th>
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<tbody>
<tr>
<td>1 Two experiments</td>
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<tr>
<td>2 Certified practical record book</td>
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<td>3 Certified tour report/field diary</td>
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<td>4 Viva-voce</td>
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<td><strong>Total</strong></td>
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### GONDWANA UNIVERSITY, GADCHIROLI

**Faculty of Science**

**B. Sc. I year**  
**Semester I and II**  
**Environmental Science**

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Paper</th>
<th>Paper title</th>
<th>Marks</th>
<th>Total marks</th>
<th>Total marks</th>
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<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td>Internal</td>
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<tr>
<td><strong>B.Sc. First Year</strong></td>
<td>I</td>
<td>I</td>
<td>Fundamentals of Environmental Science</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<td></td>
<td></td>
<td>II</td>
<td>Ecology</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<td></td>
<td>Practical</td>
<td>30</td>
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<td>30</td>
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<tr>
<td></td>
<td></td>
<td>I</td>
<td>Environmental Chemistry</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<td></td>
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<td>II</td>
<td>Species Ecology</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<td></td>
<td>Practical</td>
<td>30</td>
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<td>30</td>
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</tbody>
</table>

Note: The Syllabus is based on 6 theory periods per week and 6 practical periods per week per batch.
Semester I
Paper I
Fundamentals of Environmental Science

Unit I: Origin of the Earth


Unit II: Atmospheric Science


Unit III: Hydrosphere

2. Fresh Water Environment: Fresh water resources of India. Fresh water requirement of India. Lentic and Lotic environment with their characteristic features. Stratification: thermal, oxygen and other nutrients.
Unit IV: Lithosphere


Books for Reference:

2. A textbook of environment – Agrawal, Mcmillion publication, Mumbai
8. Air Pollution – A.C. Stern
9. Environmental Problems and solution- Asthana, S. Chand and company, New Delhi.
Semester I
Paper II
Ecology

Unit I: Basics of Ecology


2. **Environment in Action**: Definition of environmental factors, Types of environmental factors, Abiotic factors: Temperature, light, water, humidity, precipitation, fire, wind and microclimate, Shelford’s law of Tolerance, Liebig’s law of Minimum.

3. **Interactions among Organisms**: Biotic interactions, Positive interactions: Mutualism, commensalisms, protocorporation, Negative interactions: Exploitation, antibiosis, competition.

Unit II: Organisms Ecology

1. **Population Ecology**: Definition, Characteristics of population: natality, mortality, age distribution, growth (S and J shaped curve), dispersion, migration, Biotic potential and environmental resistance, Concept of carrying capacity, Estimation of population density, Age structure of population, Regulation of population size.

2. **Community Ecology**: Definition, Characteristics of community: species diversity, growth form and structure, dominance, succession and trophic structure, Ecotone and edge effect, Ecological niche, Community turnover, Community interdependence, Major and minor community, Key stone species, Ecotypes and its significance.

3. **Community Dynamics**: Definition of ecological succession, Characteristics of succession, General process, Types, Significance of ecological succession, Other types of succession: xerosere, hydrosere and mesarch.

Unit III: Ecosystem Ecology

1. **Ecosystem**: Definition, Types of ecosystem, Terrestrial: forest and grassland, Aquatic: lotic and lentic, Structure of an ecosystem, Function of an ecosystem, Food chain: grazing and detritus and trophic level, Significance and method of analysis of food chain, Ecological pyramids: number, biomass and energy.

2. **Ecosystem Processes**: Definition of productivity, Fundamental aspects of productivity, Primary and secondary productivity, GNP, GPP, NPP, NCP, Measurements of productivity, harvest method, oxygen method and carbon dioxide method.


Unit IV: Organism and Environment

1. **Adaptation**: Types of adaptations, Adaptation in plants: hydrophytes, mesophytes and xerophytes, Adaptation in animals: aquatic and desert.

2. **Colouration**: Colour production, Chemical colours, Biological significance of colours, Valuable colours: cryptic, warning and signalling, courtship, Causes of colouration, Importance of colouration, Camouflage.

3. **Mimicry**: Protective mimicry, Batesian and Mullerian mimicry, Cause of mimicry, Evolution of mimicry, Bio-mimicry.
Books for Reference:

Semester I
Practical

1. Groundwater and surface water sampling and its storage techniques.
2. Determination of Temperature of given water sample.
4. Determination of pH of the given water sample by Electrometric method.
5. Determination of Electrical conductivity of the given water sample by conductivity meter.
6. Determination of Turbidity of the given water sample by Nephelometric method.
7. Determination of total solids, total suspended solids, total dissolved solids by gravimetric method.
8. Determination of ambient air temperature by mercury thermometer.
10. Determination of wind speed with the help of Robinson’s anemometer.
11. Determination of Solar intensity by Lux meter.
12. Soil sampling methodology by quartering method.
13. Determination of bulk density of the given soil sample.
14. Determination of water holding capacity of the given soil sample.

Books for Reference:

B. Sc. I year
Semester II
Environmental Science
Unit I: Aquatic Chemistry


Unit II: Environmental Problems


2. **Global Climate Change:** Global climate change process. Effects of climate change on: polar ice caps, glaciers, agriculture, sea level rise, diseases, small islands, wildlife, water resources and ecosystem. Control measures.


Unit III: Environmental Priorities in India

1. **Environmental Education:** Goals. Objectives. Environmental education in India (formal and non formal). Environmental organizations and agencies (National and International).


Unit IV: Environment and Sustainable Development


3. **NGO’s in Environmental Protection:** Different NGO’s in environmental protection and their role at local, national and international level.
Books for Reference:

2. A textbook of environment – Agrawal, Mcmillion publication, Mumbai
9. Environmental Problems and solution – Asthana, S. Chand and company, New Delhi.
Semester II
Paper II
Species Ecology

Unit I: Distribution of Organisms

1. Biomes: Definition. Major biomes of the world (desert, grassland, rainforest, deciduous forest, taiga and tundra).

Unit II: Behavior Ecology


Unit III: Brooding and Communication


UNIT IV: Applied Ecology

1. Conservation of Forests: Importance of forest, major types of forest in India. Minor forest products. Causes of forest destruction- deforestation, forest fire-natural and manmade conservation of forest- afforestation, reforestation, joint forest management (JFM).
2. Wildlife: Definition, significance of wildlife, status of wildlife in India, causes for depletion, categories of threatened, endangered, rare, and extinct species, red data book.
Books for Reference:

Semester II
Practical

1. Determination of Alkalinity of the given water sample by titration method.
2. Determination of Acidity of the given water sample by titration method.
3. Determination of Hardness of the given water sample by EDTA titration method.
4. Determination of Chlorides of the given water sample by Mohr’s method.
5. Determination of Dissolved Oxygen in the given water sample by Winkler’s method with Azide modification.
6. Determination of Free Chlorine of the given water sample by iodometric method.
7. Determination of moisture content of the given soil sample.
8. Determination of total organic carbon and percent organic matter of the given soil sample
9. Measurement of the Primary productivity of the given water body by Light and Dark bottle method.
10. Measurement of the Primary productivity of the given area by harvest method.
12. Observation and study of the following relationship:
   1. Predator: Duck, Fish
   2. Parasites: Cuscuta
   3. Symbiosis: Lichens, Admesia (Sea anemone)
   4. Mutualism: Rhizobium, Termite, Honeybee
13. Identification and characterization of common Igneous, Sedimentary and Metamorphic rocks.

Books for Reference:

2. Water and Wastewater Analysis National Environmental Engineering Research Institute (NEERI), Nagpur.