B.Sc. II year Environmental Science
Semester IV

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

- The examination of Semester III 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 IV 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.

Distribution of Practical Marks (Semester III and IV)

<table>
<thead>
<tr>
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<th>Description</th>
<th>Marks</th>
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<tbody>
<tr>
<td>1</td>
<td>Two experiments</td>
<td>20 marks (10 marks each)</td>
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<tr>
<td>2</td>
<td>Certified practical record book</td>
<td>04 marks</td>
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<tr>
<td>3</td>
<td>Certified tour report/field diary</td>
<td>03 marks</td>
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<tr>
<td>4</td>
<td>Viva-voce</td>
<td>03 marks</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>30 marks</strong></td>
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## GONDWANA UNIVERSITY, GADCHIROLI

**Faculty of Science**

**B. Sc. II year**  
**Semester III and IV**  
**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>
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<tbody>
<tr>
<td>B.Sc. II Year</td>
<td>III</td>
<td>I</td>
<td>Pollution Science</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<tr>
<td></td>
<td></td>
<td>II</td>
<td>Natural Resources and GIS</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<tr>
<td></td>
<td></td>
<td>Practical</td>
<td>Practical</td>
<td>30</td>
<td>-</td>
<td>30</td>
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<tr>
<td>B.Sc. II Year</td>
<td>IV</td>
<td>I</td>
<td>Pollution Control Technologies</td>
<td>50</td>
<td>10</td>
<td>60</td>
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<td></td>
<td></td>
<td>II</td>
<td>Forest &amp; Wildlife</td>
<td>50</td>
<td>10</td>
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<td>Practical</td>
<td>Practical</td>
<td>30</td>
<td>-</td>
<td>30</td>
</tr>
</tbody>
</table>

Note: The Syllabus is based on 6 theory periods per week and 6 practical periods per week per batch.
B.Sc. II Year
Semester IV
Environmental Science
Semester IV  
Paper I  
Pollution Control Technologies  

Unit I: Air Pollution Control  

1. **Industries and Zoning Criteria**: Classification of industries and their areas. Zoning criteria, present zoning practices in India. Pollution prevention: cleaner technologies—change in raw material, process change.  

2. **Control Devices for Particulates**: Atmospheric cleansing process, approaches to contaminated control. Dry collection devices: gravitational settling chambers, centrifugal collectors, fabric filters (bag house filters), electrostatic precipitators (ESP); wet collectors: cyclonic scrubbers, spray chambers, venture scrubbers, packed towers, construction and working.  

3. **Control Devices for Gases**: Adsorption, absorption, condensation, combustion. Flue gas desulfurization (FGD) and NOx removal. Euro norms and Bharat norms. Role of IPCC in Climate Change. Antidote to MIC.  

Unit II: Water Pollution Control  

1. **Basics of Water Pollution Control**: Prevention of water pollution. Impurities in water: suspended and dissolved. Principle and process of sedimentation, coagulation, filtration and disinfection.  


3. **Oil Pollution Control**: Nutrient enrichment, seeding with naturally occurring microorganisms, and seeding with genetically engineered microorganisms. Ballast water management.  


Unit III: Noise and Radiation Pollution Control  

1. **Noise Pollution Control**: Noise control at source; receiver end and along the sound path. Noise barriers, mufflers or silencers, vibration isolation, damping, lagging, protection of the personal- ear plugs, ear muffes, helmets; acoustic absorptive material. Methods of reducing highway noise.  


3. **Control of Occupational Health Hazards**: Occupational health plan, objectives. Types of personal protective equipments, personal safety from illumination, ventilation, vibration, humidity, overhead equipments handling, control of fire, analysis of accidents, remedies, safety education, first aid: principles, methods and training.
Unit IV: Soil and Pesticide Pollution Control

1. Soil Pollution Control: *In-situ* soil remediation: flushing, soil vapour extraction, sparging. Ecofarming and ecotechnology, integrated nutrient management, integrated pest management.


Semester IV  
Paper II  
Forest & Wildlife

Unit I: Forest

2. **Forest Measurement**: Diameter, girth, height and volume of trees, annual increment, sampling methods and sample plot. Forest cover monitoring through remote sensing and geographical information systems. Surveying and forest engineering.
3. **Forest Destruction**: Forest fires: causes (natural and anthropogenic), classification of forest fires, types of forest fires. Deforestation: causes and factors. Distinction between deforestation and degradation. Timber extraction. Dams and their effects on forest.

Unit II: Forest Conservation

1. **Silviculture**: General silvicultural principles. Ecological and physiological factors influencing vegetation, nursery system, silviculture practices in specialized ecosystem like terrestrial and mangroves. Silviculture of trees: traditional and advanced methods.
2. **Tree Improvement**: General concept, methods and techniques. Stand structure and dynamics. Sustained yield, rotation of growing through management, forest working plan. Integrated approach management and forest mensuration.

Unit III: Wildlife


Unit IV: NGO and People’s Action


**Books for Reference:**
15. A Textbook of Environment - Agrawal, McMillion publication, Mumbai
29. Industrial Safety and Environment - Anupama Prasar. S. K. Kataria & Sons, Delhi
Semester IV
Practical

Section A: Water and Energy

1. Study of lake water for pH, temperature, phosphate, nitrate, sulphate for status of a lake
2. Study of irrigation water for its suitability for crops
   a. Analysis of Na\(^+\) content in irrigation water
   b. Analysis of chloride in irrigation water
   c. Analysis of hardness in irrigation water
   d. Analysis of alkalinity in irrigation water
3. Study of agricultural and wasteland for fertility and productivity
   a. Analysis of soil sample (agriculture and wasteland) for organic carbon and organic matter
   b. Analysis of soil sample for NPK
   c. Analysis of soil sample for micronutrients (Fe, Zn, Mn)
4. Study of purity of unleaded petrol of selected petrol pump
5. Demonstration on non conventional energy resource system (solar cooker, solar water heater)
6. Study of biogas plant/anaerobic reactor for efficiency
   a. Analysis of biogas slurry for pH
   b. Analysis of biogas slurry for acidity
   c. Analysis of biogas slurry for alkalinity
   d. Analysis of biogas slurry for solids (total solids, total suspended solids, volatile solids)
   e. Analysis of biogas slurry for volatile acids
   f. Analysis of biogas slurry for methane by Orsat apparatus
7. Determination of impurities in raw water and treated water w.r.t. suspended solids and dissolved solids.
8. Determination of coagulant dose by Jar test apparatus w.r.t. suspended solids or turbidity removal.
9. Determination of suspended solids before and after filtration unit in water treatment unit.
10. Determination of free chlorine in municipal treated waster sample.
11. Proximate analysis of coal for moisture content, volatile matter and carbon content.
12. Collection and determination of groundwater (bore well) having depth of 50 m, 100 m and 200 m for fluoride, iron, nitrate, hardness and chloride.
14. Studies of lake restoration : Collection and analysis of lake water (inlet and outlet) for removal of nutrients (sulphate, phosphate, nitrate)
15. Analysis of lake water sample before and after exposure to heavy metal contaminated sample
   i) iron and manganese, ii) nutrients (nitrogen, sulphate and phosphate)
16. Collection and analysis of forest floor soil, its comparison with agriculture and wasteland soil w.r.t. pH, calcium, magnesium hardness, alkalinity, conductivity, bulk density, NPK, iron, zinc and manganese.
17. Separation of metal ion copper by solvent extraction method (Cu-DDC)
18. Separation of metal ion nickel by solvent extraction method (Ni-DMG)
Section B: Natural Resources

1. Analysis of alpha, beta and gamma diversity of an ecosystem
2. Demonstration on survey methods including participatory learning methods
3. Demonstration on human aspects of conservation
4. Visit to a wetland areas
5. Documentation of treats to a wetland
6. Analysis of vermicompost for physiochemical analysis (pH, EC, nitrogen, percent carbon, phosphorous)
7. Determination of NPK of contaminated soil
8. Demonstration of land use patterns of the region
9. Study of medicinal plants of local area
10. Demonstration of soil testing of agricultural land before and after cropping
11. Demonstration on commonly found in wildlife of National Park in the region
12. Measurement of solar constant