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

- The examination of Semester V 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 VI 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 V and VI)</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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GONDWANA UNIVERSITY, GADCHIROLI

Faculty of Science

B. Sc. III year
Semester V and VI
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>V</td>
<td>I</td>
<td>Theory</td>
<td>Environmental Engineering</td>
<td>50 10</td>
<td>60</td>
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<td></td>
<td>II</td>
<td>Theory</td>
<td>Environment and Innovations</td>
<td>50 10</td>
<td>60</td>
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<td></td>
<td>Practical</td>
<td>Theory</td>
<td>Practical</td>
<td>30</td>
<td>30</td>
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<tr>
<td>VI</td>
<td>I</td>
<td>Theory</td>
<td>Environmental Management</td>
<td>50 10</td>
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<td></td>
<td>II</td>
<td>Theory</td>
<td>Environmental Restoration</td>
<td>50 10</td>
<td>60</td>
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<td></td>
<td>Practical</td>
<td>Theory</td>
<td>Practical</td>
<td>30</td>
<td>30</td>
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Note: The Syllabus is based on 6 theory periods per week and 6 practical periods per week per batch.
Unit I: Solid Waste and Hazardous Waste Management


**Case study**: Solid waste management of a city.

Unit II: Industrial Wastewater Treatment


**Case study**: Pulp & paper industry wastewater treatment.

Unit III: Cleaner Technologies and EMS

1. **Cleaner Technologies**: Pollution reduction at source. Material modification and end of pipe technology. Eco labelling and Green building.


Case study: Implementation of cleaner technologies in an industry.

Unit IV: Environmental Impact Assessments


Case study: Carry out an EIA study for a coal mine.

Books for Reference:

1. Natural Hazards—Local, National, Global: G. F. White, Oxford University Press.
7. Introduction to Environmental Impact Assessment: Glasson; Research Press
10. Environnmental management: H. M. Saxena; Rawat Publications
20. Textbook of Environmental Science and Technology, BSP Books Pvt. Ltd., Hyderabad
27. Water Supply & Sanitary Engineering: G.S. Birdie
28. Managing industrial pollution (2003), S C Bhatia, Macmillan India Ltd. Mumbai
31. Environmental Sanitation, B. Kapoor, S. Chand and company, New Delhi

Semester VI
Paper II
Environmental Restoration

Unit I: Restoration Ecology


Unit II: Eco-restoration Methods

Unit III: Eco-restoration of Abiotic Environment


2. **Eco-restoration of Water and Air**: Eco-restoration of groundwater, surface water (restoration of lakes, river, streams). Restoration of contaminated air: planting air pollutants absorbing plants, potential of carbon sequestration, design of space for plantation, planning and designing of green belt development in and around city. Role of local biodiversity management committee for restoration.

3. **Eco-restoration of Hazard Hit Areas**: Eco-restoration of super cyclonic hit areas. Restoration of snowstorm hit areas. Restoration of earthquake hit areas, volcanoes, landslides and floods affected areas.

Unit IV: Eco-restoration of Biotic Environment

1. **Restoration of Natural Resources**: Restoration of forest land, range land, restoration of wild animals, plants, role of forest research institutes. IIFM-Bhopal.


Books for Reference:

1. Managing Cover Crops Profitably, Handbook Series Book, Published by the Sustainable Agriculture Research and Education (SARE) program
3. Manage insect on your farm, Miguel A. Altieri and Clara I. Nicholls with Marlene A. Fritz, Published by the Sustainable Agriculture Network Beltsville, MD, USA.
4. A Whole-Farm Approach to Managing Pests, Sustainable Agriculture Research and Education (SARE) program.
5. Smart Water Use on Your Farm or Ranch, Sustainable Agriculture Research and Education (SARE) program.
and A K Handique, Biotechnology Division, North-East Institute of Science & Technology, CSIR, Jorhat 785 006, Assam, India.


15. Principles and Guidelines for ecological restoration in Canada's Protected Natural Areas, Compiled by: National Parks directorate parks Canada agency gatineau, Quebec.

Semester VI
Practical

Section A: Environmental Restoration

1. Study on nature’s healing potential (rejuvenation after fire in forest), agricultural system.
   i. Analysis of soil for NPK, organic carbon, inorganic carbon, trace metals etc.
2. Study on indigenous knowledge about eco-restoration: plantation and fire protection.
3. NGO’s activities about restoration of lakes: Dewatering, weed removal, control of sewage flow, activities of fisherman communities.
4. Demonstration on nursery system (seed collection, preparation of pot), method of full grown tree plantation in urban area.
5. Pilot plants study on removal of pollutants by aquatic weeds (heavy metals) and other impurities.
6. Studies on restoration and re-stabilization of coal overburden dump by using different vegetation.
7. Studies on fertility of soil
   i. Collection of soil sample before, during and after cropping.
   ii. Analysis of physicochemical and biological parameters for fertility of soil
8. Studies on coal mine affected areas:
   i. Collection of fresh over burden sample
   ii. Collection of primary succession over burden sample for physicochemical analysis.
   iii. Collection of secondary and climax vegetation on over burden for restoration studies.
9. Aerobiological studies of urban air environment
i. Exposing nutrient plate to clean area, market area, slaughter house, traffic areas for microbes.

ii. Dust fall studies by Dust fall jar

10. Wetland studies w.r.t.
   i. Collection of soil sample
   ii. Analysis of physicochemical parameters
   iii. Soil dwelling fauna

11. Studies on restoration of non mineral exploited hills or plains for
   i. Soil analysis
   ii. Remedial measures


13. Groundwater restoration studies in urban and rural areas w.r.t. floatables (calcium, magnesium, suspended layer), dissolved calcium, TH, total acidity, fluoride.

14. Studies on restoration of lakes
   i. Collection lake water samples for in situ control
   ii. Planning and designing lake conservation measures

15. Comparative analysis of river water quality before and after recreation activities viz. bathing, washing cloths and washing domestic animals.

16. Analysis of streams water for assessment of self purification capacity

17. Studies and demonstration on carbon sequestration of plants/vegetation

18. Draw the design of green belt development by the road sides and industries

19. Survey of local biodiversity communities involved in protection of trees in your areas.

20. Demonstration on restoration of flood hit areas.

21. Demonstration of on gene campaign in India w.r.t.
   i. Collection of indigenous seeds
   ii. Discussion with people
   iii. Preparation of herbarium (digital)
   iv. Collection of fauna in digital format

22. To study forest management activities of IIFM, Bhopal.

23. Draw map and parameter for space design for vegetation in urban areas/rural areas.


25. Case studies on man animal conflict in your area.

26. Determination of pH, acidity, alkalinity, organic carbon, nitrogen from compost

27. Determination of suspended solids and total solids of raw sewage and sedimentation unit in waste water treatment plant.

28. Qualitative study of flora and fauna of aeration tank of waste water treatment plant.

Section B: Solid Waste Management and Wastewater Treatment

1. Sampling of solid waste by quartering method.

2. Determination of moisture content of the given solid waste sample by gravimetric method.

3. Determination of calorific value of the given solid waste sample by Bomb calorimeter method.

4. Determination of volatile and non-volatile matter of the given solid waste sample.

5. Estimation of Chemical Oxygen Demand of the given wastewater sample by open reflux method.
6. Estimation of Bio-chemical Oxygen Demand of the given wastewater sample by BOD 5 day method.
7. Estimation of phosphate of the given wastewater sample by stannous chloride method.
8. Estimation of sulphate of the given wastewater sample by precipitation method.
10. Estimation of Bismuth in the given wastewater sample.
11. Estimation of Vanadium in the given wastewater sample.
12. Estimation of Nitrate in the given wastewater sample.
14. Determination of different solids (total, suspended and dissolved) in a wastewater sample.