Gondwana University, Gadchiroli
Semester Pattern Syllabus for
B. Sc. III year, Semester V
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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</thead>
<tbody>
<tr>
<td>1 Two experiments</td>
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<tr>
<td>2 Certified practical record book</td>
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<tr>
<td>3 Certified tour report/field diary</td>
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<tr>
<td>4 Viva-voce</td>
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| Total | 30 marks |
## 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>
<th>Total marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.Sc. III Year</td>
<td>V</td>
<td>I</td>
<td>Environmental Engineering</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td>Environment and Innovations</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Practical</td>
<td>30</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td>I</td>
<td>Environmental Management</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td>Environmental Restoration</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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.
Semester V  
Paper I  
Environmental Engineering

Unit I: Environmental Sampling


Unit II: Instrumentation and Errors


Unit III: Operation and Maintenance of Pollution Treatment Units

1. **Wastewater Treatment Units**: Operation and maintenance procedure of screen, grit chamber, oil and grease trap, equalisation tank, agitator and dosing tanks, flash mixers and clarifloculator.

2. **Aeration Tanks**: Operation start up procedure, aeration tank start up with seed, seedling and culture transfer, normal operating procedure, determination of sludge age, wasting activated sludge, effluent characteristics, troubleshoot mechanism.
   a. Settling tank-operation, operation troubles, prevention and cure.
   b. Sludge drying bed-operation troubles, prevention and cure.
   c. Operation and maintenance of aerators and pumps.
3. **Air Pollution Control Units**: Fabric filters: operational problems and maintenance procedure. Inspection and maintenance procedure for electrostatic precipitators.

**Unit IV: Corporate Management**


**Books for Reference:**

5. Environmental Sanitation (2001), Baljeet Kapoor, S. Chand and Company, New Delhi
7. Text Book of Environment, K.M. Agrawal, McMillan India Limited
9. Environmental Pollution Control Engineering (2012), G.R. Chatwal, Himalaya Publishing House, Mumbai

**Semester V**
**Paper II**

**Environment and Innovations**

**Unit I: Environmental Innovations**


Unit II: Sustainable Innovations


Unit III: Environmental Innovations - I


Unit IV: Environmental Innovations - II


Books for Reference:

1. Ecosystem approach to disaster risk reduction-Anil K Gupta, Sreja S Nair, National Institute of Disaster Management, New Delhi.
2. Ecological restoration implementation plan, United States Department of Agriculture, January 2013.
3. Ecological restoration: A practical approach-Steven I Apfebaum, Buodhead WI 53520
5. Wetland restoration: A handbook for New Zealand freshwater systems hydrology- Dave Campbell
6. Ecologically based stream restoration in New York Coastal Watersheds-Any B Filipowicz, New York State Department, July 2006
7. Ecological restoration for protected areas, principles, guidelines and best practices, IUCN
8. Sea grass habitat restoration management plan, Dept. of Interior, Florida
9. Eco-Innovation final Report for Sectoral Innovation Watchalasdair Reid Michal Miedzinski
11. Promoting Eco-Innovations to Leverage Sustainable development of Eco-Industry and Green Growth by1dr. A.N. Sarkar, Published By Ecsdev, Via Deifiori, 34, 00172, Rome, Italy
12. Sustainable Innovation Exploring A New Innovation Paradigm by Dorothea Seebode
13. Design Link Ontwerpers dorothea Seebode, June 2011

Semester V
Practical

Section A: Environmental Innovations

1. Demonstration on innovation and eco-innovation characteristics waves of innovation and history.
2. Demonstration on eco-industry and process.
3. Demonstration on cultivation crops on city roof tops.
6. Collection and preservation of herbarium of indigenous seeds of local area.
7. Demonstration and study of ecological and pest control management (birds and insects).
8. Study of crop improvement after NPK addition, foliar spray and bio-pesticide application.
9. Survey and demonstration on organic agricultural products in local area.
10. Demonstration of conservation of turtles in Orissa.
11. Analysis of rain water harvesting pit, quantification of rain water collection.
12. Analysis of hand pump water for fluoride and iron concentration
13. Physical innovations:
   i.Free public transport
   ii.Floating house in rising sea
   iii.Sustainable building material from solid waste
v. Nano flake for solar cells
vi. ITC for sustainable growth
vii. Greener mobile phones
viii. Traffic congestion reduction
ix. Green urban planning Brazil.
14. Chemical innovations:
   i. On board capture for carbon for vehicles
   ii. Mine water power station
   iii. Extraction of water from atmosphere in hill terrain
   iv. Washing whiter without water Eco-surfactant
15. Biological innovations:
   i. Second generation bio-fuels for commercial flights
   ii. Cultivating crops on city root tops
   iii. Biodegradable ink
16. Demonstration on Pani Panchyat
17. Visit to Rajgad village for the study of Natural Resources and Biodiversity
18. Visit to Menda Lekha village for the Natural Resources and Biodiversity Management
19. Demonstration on Health improvement programme by Search-Gadchiroli
20. Demonstration on innovative practices adopted by Anandvan village, Warora, Chandrapur.

Section B: Instrumentation and Statistics

1. Demonstration on spectrophotometer and determination of \( \lambda \) max.
2. Standardization of weighing weight and determination of errors.
3. Estimation of Na\(^+\) and K\(^+\) by Flame photometer.
4. Construction of frequency table and frequency polygon.
5. Computation of mean, median, mode and range for a given set of data.
6. Computation of standard deviation for a given set of data.
7. Analysis of correlation coefficient matrix of the given set of data.
8. Collection and preservation of grab water sample, composite and integrated water sample.
9. Comparative studies of physicochemical parameters of grab/composite and integrated waters samples.
10. Comparative studies of pH, total alkalinity, conductivity, total acidity, chloride, sulphate of surface and ground water samples.
13. Demonstration on titrimetry, acid-base titration.
14. Demonstration on gravimetry, analysis of water samples for parameters viz. TDS and TS.
16. Determination of dissolve oxygen of raw waste water and aeration tank.
17. Demonstration on trouble shooting and maintenance procedure of fabric filter and ESP.
18. Industrial studies on human resource management.
19. Studies on industrial safety, security, types of equipments & training.
20. Demonstration on industrial management.
22. Studies on decision making, planning and environmental management in Industrial operations.

Books for Reference: