

**M.Sc. II year Environmental Science  
Semester IV**

**Gondwana University, Gadchiroli  
Semester Pattern Syllabus for  
M. Sc. II Year  
Semester IV  
Environmental Science**

# GONDWANA UNIVERSITY, GADCHIROLI

## Faculty of Science

### Semester Pattern Syllabus

#### M. Sc. II year

#### Semester III and IV

#### Environmental Science

Year	Semester	Paper no.	Paper Title	Marks		Total marks
				Theory	Int. Ass. *	
M.Sc. II Year	III	I	Water Treatment and Supply	80	20	100
		II	Wastewater Treatment	80	20	100
		III	Air Pollution Control	80	20	100
		IV	Solid and Hazardous Waste Management	80	20	100
		Practical I	Water Treatment and Supply	80	20	100
		Practical II	Wastewater and Air Pollution	80	20	100
	IV	V	EIA and Environmental Laws	80	20	100
		VI	Pollution Control and Industrial Safety	80	20	100
		VII	Environmental and Energy Management	80	20	100
		VIII	Sustainable Environment	80	20	100
		Practical I	Environmental Management and Sustainable Environment	80	20	100
		Project	Project (Dissertation)	80	20	100

Note: The syllabus is based on 4 theory periods per week per paper of one hour duration and 8 practical periods per week per batch.

### **General Instructions:**

- The examination shall comprise of four papers in this semester and one practical and a dissertation (project work).
- Practical examination will be of twelve hours duration and will be extended over two days.
- Each theory paper will be of three hours duration and shall carry 80 marks.
- The examinee shall be required to pass in theory and practical's, separately.

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#### **Distribution of Practical Marks (Semester IV, practical I)**

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1	One major experiment	30 marks
2	Two minor experiments	30 marks (15 marks each)
3	Certified practical record book	05 marks
4	Certified tour report/field diary	05 marks
5	Viva-voce	10 marks
<b>Total</b>		<b>80 marks</b>

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**Scheme of Teaching and examination under credit grade semester pattern for  
M.Sc. II year (Semester III and IV) Environmental Science**

Semester	Theory Paper/ Practical	Teaching Scheme (Hrs/week)			Examination Scheme					
		Th.	Pr.	Total	Duration (Hrs)	Max. Marks		Total Marks	Min. Passing Marks	
						Theory Marks	Internal Marks		Theory	Practical
III	I	4	--	4	3	80	20	100	40	--
III	II	4	--	4	3	80	20	100	40	--
III	III	4	--	4	3	80	20	100	40	--
III	IV	4	--	4	3	80	20	100	40	--
III	Practical I	--	8	8	12	80	20	100	--	40
III	Practical II	--	8	8	12	80	20	100	--	40
III	Seminar	2	--	2	--	--	25	25	10	--
	<b>Total</b>	<b>18</b>	<b>16</b>	<b>34</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>625</b>	<b>170</b>	<b>80</b>

Semester	Theory Paper/ Practical	Teaching Scheme (Hrs/week)			Examination Scheme					
		Th.	Pr.	Total	Duration (Hrs)	Max. Marks		Total Marks	Min. Passing Marks	
						Theory Marks	Internal Marks		Theory	Practical
IV	V	4	--	4	3	80	20	100	40	--
IV	VI	4	--	4	3	80	20	100	40	--
IV	VII	4	--	4	3	80	20	100	40	--
IV	VIII	4	--	4	3	80	20	100	40	--
IV	Practical I	--	8	8	12	80	20	100	--	40
IV	Project	--	--	--	--	80	20	100	--	40
IV	Seminar	2	--	2	--	--	25	25	10	--
	<b>Total</b>	<b>18</b>	<b>8</b>	<b>26</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>625</b>	<b>170</b>	<b>80</b>

**M.Sc. II year**  
**Semester IV**  
**Environmental Science**

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**Semester IV**  
**Paper V**  
**EIA and Environmental Laws**

**Unit I: Fundamentals of Environmental Impact Assessment**

1. **Basic concept of EIA:** Introduction, salient features of EIA, EIA procedure (Initial Environmental examination IEE, Analytical Functions of EIA, (Scope of EIA, Identification of Impact, prediction, Impact evaluation & analysis).
2. **EIA as planning tool:** Role of EIA in the planning and decision making process. Public participation in EIA, definition and concepts, objectives, techniques, advantages and limitations. Strategies for environmental management plan and green belt development. Role of mathematical models in EIA. Role of statutory agencies in EIA clearance.
3. **EIA for industry:** EIA process to project, planning and implementation, guideline for preparation of Environmental Base Map (EBM), Identification of study area, classification of environmental parameters, formation of EIA study team, Preparation of EIA Report- Essential steps to complete an environmental impact assessment, EIA format by CPCB, Environmental monitoring and management plan, final content of Environmental Impact Statement.

**Unit II: EIA Methodologies**

1. **Methodology:** General criteria for the selection of EIA methodology (impact identification, impact measurement, impact interpretation and evaluation, impact communication)
2. **EIA methods:** Adhoc methods, advantages and disadvantages, checklist-simple, descriptive, scaling, scaling weighting checklist, Battelle Environment Evaluation System (BEES). Computer aided EIA.
3. Matrix methods, general characteristics, salient features of matrices methods. Simple interaction matrix method, stepped matrix method, network methods, stepped matrix technique for networks, overlay methods, cost benefit analysis, prediction and assessment of impacts on soil and groundwater, surface water, biological environment, air environment, noise, socio-economic and human health impacts. EIA case studies, environmental audit-pre, onsite and post audit.

**Unit III: Constitution and Environment**

1. **Constitutional law:** Environmental concerns in constitution such as State, fundamental rights, directive principles, fundamental duties, judicial activism, VII schedule, provisions relating to environment in these.
2. **Constitution and environment:** Provisions relating to control of pollution in India, Penal Code 1860, Code of Criminal Procedure 1973, Code of Civil Procedure 1908.
3. **Judicial activism and environmental protection:** Indian constitution and environmental protection, Water (Prevention and Control of Pollution) Act 1974, Salient features, Air (Prevention and Control of Pollution) Act 1981, Noise Pollution (Regulation and Control) Rules, 2000.

## Unit IV: Environmental Laws

1. **Environmental protection:** Issues and problems, key interactional efforts for environmental protection, Indian movement for environmental protection-Bishnoi tradition, Chipko movement, Silent valley movement, Sardar Sarovar Project.
2. **Basic environmental laws:**
  - 1986- The Environmental (Protection) Act.
  - 1989- The Manufacturing, Storage and Impact of Hazardous Rules.
  - 1995- The National Environmental Tribunal Act.
  - 1998- The Biomedical Waste (Management and Handling) Rules.
  - 2000- The Municipal Solid Waste (Management and Handling) Rules.
  - 2000- The Ozone Depleting Substances (Regulation and Control)
3. **Specific environmental laws:**
  - 1948- The Factories Act and Amendment in 1987.
  - 1972- The Wildlife Protection Act, Rules 1973 and Amendment, 1991.
  - 1977- The Water (Prevention and Control of Pollution) Cess Act.
  - 1980- Forest Conservation Act.
  - 1988- The Motor Vehicles Act.
  - 1991- The Coastal Regulation Zone Modification.
  - 2002- The Biological Diversity Act.

### Books for Reference:

1. Environmental Impact Assessment: Principles and Procedures, John Wiley and Sons, New York.
2. Environmental Impact Assessment: A.K. Shrivastav, APH Publishing Corporation, New Delhi.
3. Environmental Impact Assessment: S. A. Abbasi, D. S. Arya, Discovery Publishing House, New Delhi.
4. Environmental Pollution Control: Neelima Rajvidya and Dilipkumar Markandey, APH Publishing Corporation, New Delhi. (2005)
5. Environment Problems and Solutions: D. K. Asthana and Meera Asthana, S.Chand & Co. Ltd. New Delhi.
6. An Introduction to Environmental Management: Dr. Anand S. Bal, Himalaya Publishing House, New Delhi.
7. Environmental Impact Analysis Handbook: John G.R. and David C. Wooten, McGraw Hill Publications. (1987)
8. Encyclopedia of Ecology and Environment: Environmental Impact Assessment Vol. 7: By Trivedi P.R., Indian Institute of Ecology and Environment, New Delhi (1999)
9. Environmental Law and Policy in India: Divan S and Rosencraz A, Oxford University Press, New Delhi. (2001)
10. Environmental Laws of India - An Introduction: CPR Environmental Education Centre, Chennai (2001).
11. Environmental Impact Assessment Methodologies Anjaneyulu, Y. and Manickam W. BSP Books Pvt. Ltd., Hyderabad (2010)
12. Environmental Impact Analysis Handbook: J. G. Rau and D. C. Wooten; McGraw-Hill Book Co.

**Semester IV**  
**Paper VI**  
**Pollution Control and Industrial Safety**

**Unit I: Industrialization**

1. **Basis for industrialization:** Industrial development in India, The role and pattern of industrialization, large and small scale industries, their nature, importance and problems, factors of industrialization.
2. **Industrial economics:** Scope of industrial economics, industrialization and economic development, Industrial sickness: problems and remedial measures.
3. **Industrial policy:** New industrial policy and its appraisal, the legal framework of industrial regulation in India. Categories of industries-red, orange and green.

**Unit II: Pollution Control in Industries**

1. **General treatment:** Common effluent treatment plant (CETP), principles, on site pretreatment of wastewaters, step wise treatment in CETP.
2. **Pollution control for specific pollutants:** Removal of BOD; biological oxidation units, removal of chromium and mercury, reduction, precipitation, ion exchange, reverse osmosis, lime coagulation and adsorption, removal of mercury from gaseous streams and liquid streams.
3. **Removal of ammonia/urea and phenolic effluents:** Sources of nitrogenous waste in fertilizer industries, methods for removal of nitrogen, physicochemical process, biological methods, algal-bacterial flocculation system, phenolic effluents: sources and treatment.

**Unit III: Operation and Maintenance of Treatment Units**

1. **Preliminary treatment units:** Pumps, screen's, grit chamber, oil and grease trap, equalization tank.
2. **Primary treatment units:** Aeration tank. Clariflocculator. Flash mixer. Agitator and dosing tank. Settling tank.
3. **Secondary and tertiary treatment units:** Activated sludge, trickling filter, oxidation ponds, sludge drying bed, ion exchange and reverse osmosis.

**Unit IV: Industrial Safety and Security**

1. **Industrial accidents:** Nature and causes of accidents, types of accidents, classification of accidents, cost of accidents.
2. **Industrial hazards:** Industrial fatigue nature, types and measurement, heat stress in industry, noise, vibrations, occupational stress and health.
3. **Industrial safety and security:** Planning for safety, controlling hazards, mitigation of fatigue, control of heat exposure, control of noise, controlling exposure to vibration, stress prevention and management, occupational safety, general safety rules, safety standards. Safety from fire: equipments and operational procedure.

**Books for Reference:**

1. Environmental Pollution Control Engineering, C. S. Rao, New Age International Publisher, New Delhi, 2009
2. Pollution Control in Process Industries, S. P. Mahajan, Mc-Graw Hill Publishing Company Limited, New Delhi
3. Industrial Safety and Environment, Anupama Prashar, S. K. Katariya and Son's, Delhi, 2012
4. Environment Problems and Solution, D. K. Asthana, and M. Asthana S. Chand Company Ltd. New Delhi. (2006)
5. Environmental Pollution and Control in Chemical Process Industries, S, C, Bhatia, Khanna Publishers, Delhi, 2001
6. Industrial Chemistry, B. K. Sharma, Goel Publishing House, Meerut, 2001

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**Semester IV**  
**Paper VII**  
**Environmental and Energy Management**

**Unit I: Industry and Environment**

- 1. Industry and environment:** Need of industries, industrial pollution and development, industrial clusters and pollution. Prominent industries in India and pollution. Types of industrial waste and their impact on air, water, soil with reference to pulp and paper, cement and coal mining.
- 2. Industrial pollution control:** Pollution abatement measures, rating of industries. Pollution control strategies-economic incentives, ambient and effluent standards, pollution charges, regulations for controlling environmental pollution.
- 3. Greening of industry:** Need of greening industry. Integration of government, market and community. Options for greening industry: cleaner technologies, pollution prevention, end of pipe technology.

**Unit II: Corporate Environmental Management**

- 1. Environmental management system:** Environmental management system. ISO 14001- Specification of environmental management system, ISO 14004-EMS: General guidelines on principles, systems and supporting techniques, ISO 14010-ISO 14015- Environmental auditing and related activities, ISO 14020-ISO 14024- Environmental labeling, ISO 14031-ISO 14032- Environmental performance evaluation, ISO 14040-ISO 14043- Life cycle assessment, ISO 14050- terms and definitions, ISO guide 64- Product specification.
- 2. EMS structure:** Environmental policies, environmental auditing, measuring environmental performance, environmental reporting.
- 3. EMS and industries:** EMS in small scale industries, Integration of ISO 9001: 2008 and ISO 14001:2004.

**Unit III: Energy and Environment**

- 1. Energy basics:** Energy conservation and efficiency, energy flows. Energy sources and overall energy demand and availability. Energy consumption in various sectors and its changing pattern, exponential increase in energy consumption and projected future demands. Energy consumption and its impacts on environmental climatic change.
- 2. Energy and environment:** Environmental issues, Environmental pollution and energy, Environmental management and energy. Rational use of energy-Meeting future energy needs Government policy for energy efficiency, energy conservation.
- 3. Energy pattern:** Sources of primary energy, projections of future energy use pattern, environmental effects of energy use- coal, petroleum, biomass, hydro power, socio economic implications of energy use pattern.

#### Unit IV: Energy Technology and Management

1. **Renewable technology:** Electricity-conventional fuels, hydro electricity, solar energy, wind electricity, fuel cell, geothermal energy, OTEC, MHD, comparing the different technologies.
2. **Advanced technology:** Biomass, briquetting, combined heat and power, anaerobic digestion, fuel switching, cleaner production, biochar, energy from solid waste, hydrogen- future energy source.
3. **Management:** Energy management in practice, implementing on energy management system, energy auditing, energy economics.

#### Books for Reference:

1. Corporate Environmental Management, Ed. Richard Welford, Earth Scan Publications Ltd, London, 1999
2. Installing Environmental Management Systems: A Step-by-Step guide, Christopher Sheldon and Mark Yoxon, Earth Scan Publications Ltd, London, 1999
3. Renewable Energy and Environment-A policy analysis for India, N H Ravindranath, K Usha Rao, Bhaskar Natrajan, Pradeep Monga, Tata McGraw Hill Publishing Company Ltd, 2000
4. Energy and Environment, H V Jadhav, Himalaya Publishing House, 1997
5. Non Conventional Sources of Energy, G D Rai, Khanna Publishers, Delhi, 1992
6. Sustainable Environmental Management, L.V. Gangawane and V.C. Khilare Daya Publishing House, 2007
7. Environmental Management, N.K. Uberoi, Excel Book, New Delhi, 2006
8. Energy and Environment, H. V. Jadhav, Himalaya Publishing house, Mumbai, 1997
9. Energy Management, W. R. Murphy, G. Mckay (Butterworths).
10. Energy Management Principles, C. B. Smith (Pergamon Press)
11. Efficient Use of Energy, I. G. C. Dryden (Butterworth Scientific)
12. Energy Economics, A. V. Desai (Wiley Eastern)
13. Industrial Energy Conservation, D. A. Reay (Pergammon Press)
14. Energy Management Handbook, W. C. Turner (John Wiley and Sons, A Wiley Inter Science Publication)
15. Industrial Energy Management and Utilization, L. C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington, 1988)
16. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982
17. Energy Conservation guide book, Patrick/Patrick/Fardo (Prentice hall 1993)
18. Pollution Control Strategies: World Bank Report

**Semester IV**  
**Paper VIII**  
**Sustainable Environment**

**Unit I: Emission Trading**

- 1. Introduction:** Conventions associated with Kyoto Protocol, prologue to greenhouse gas emissions, UN appointed panel on climate change, emission trading schemes, carbon credit mechanisms, valuation method of emission reduction units, profiles of companies which have benefitted from climate propriety, annexure of the countries
- 2. Emission trading:** History and design of the Kyoto Protocol, greenhouse gas trading system; joint implementation (JI); clean development mechanism (CDM); reductions of emissions from deforestation and degradation (REDD).
- 3. Emission trading scenario:** Systems for Kyoto Protocol implementation in different countries; the European Union, Indian emissions trading system; results to date.

**Unit II: Environmental Accounting**

- 1. Introduction:** Definition, National account, basic concept, objectives, scope, forms of EA, environmental management account (EMA), environmental financial account, environmental national account, balance sheet w.r.t. profit and loss under environmental accounting
- 2. Environmental accounting:** Preparation of integrated environmental and economic accounts (Satellite accounts); Produced asset, non produced economic assets, other non produced environmental assets, system of integrated environmental and economic accounts.
- 3. Valuation of natural assets:** Methods of valuation- market value approach, present value approach, net price approach, maintenance cost approach, compensation cost approach, general valuation techniques, application of methods, merits and demerits of environmental accounting.

**Unit III: Environmental Philosophy**

- 1. Environmental ethics:** Introduction, concept, basic facts and Environmental Ethics, values, science and Environmental Ethics, ethical theories applied to the environment, historical causes of environmental decline.
- 2. Ecocentric theories of nature:** Deep ecology and animal rights, environmental rights, environmental racism, environmental and business ethics, foundation of environmental ethics for business.
- 3. Environmental attitudes:** Categorization of environmental attitudes in development ethics, preservation ethics, conservation ethics, societal environmental ethics, corporate environmental ethics, individual environmental ethics, global environmental ethics, challenges of World Environmental Ethics.

**Unit IV: Sustainable Development**

- 1. Basics of sustainable development:** Definition. Concepts, principles, issues in sustainable development, strategic planning for sustainable development, economic reforms and sustainable development.
- 2. Environmental sustainability:** Types of environmental sustainability (Institutional, economical, financial and ecological sustainable agriculture, sustainability of forests and forestry, sustainable earth economy, water resources,
- 3. Society and environment:** Involving people, peoples biodiversity register (PBR), process of PBR, biological diversity act, Case study: Mendha-Lekha, village, Gadchiroli district (MS). City planning, garden cities and new towns urban redesign, designing for open space. Intellectual property rights, patenting procedure in India and abroad.

#### **Books for Reference:**

1. A Textbook of Ecotourism, Eco Restoration and Sustainable Development, A J Solomon Raju, New Central Book Agency (P) Ltd, Kolkata
2. Environmental Accounting, N. Das Gupta, S. Chand and Company Ltd. New Delhi, 2005
3. Peoples Biodiversity Register, Center for Ecology Sciences, Bangalore, 2003
4. Emissions Trading: Principles and Practice, Thomas H. Tietenberg, (Washington D.C.: Resources for the Future Press, 2006).
5. Post-Kyoto International Climate Policy: Implementing Architectures for Agreement, Joseph E. Aldy and Robert N. Stavins, (Cambridge University Press, 2010)

**Practical  
Semester IV  
Practical I**

**Environmental Management and Sustainable Environment**

**EIA**

1. Demonstration on environmental impact study of development project including management plan.
2. Demonstration and study on EIA methodologies i.e. BEES, Checklist, Adhoc, Matrices, Network.
3. Demonstration on judgment of Supreme Court on environmental issues.
4. Demonstration on environmental audit of an industry.

**Solid Waste**

1. Determination of moisture content of fly ash.
2. Estimation of calorific value of solid waste.
3. Calculation of volatile matter of solid waste.
4. Prepare bricks of solid waste.
5. Study the solid waste collection and disposal practices in city.
6. Study of solid waste management practices in the area.
7. Estimation of %organic matter, organic carbon, NPK in composted solid waste.
8. Study the design criteria of sanitary landfill.
9. Collect data on sale of plastic bag below permissible size.
10. Study and demonstration on type of biomedical waste generation and its disposal in city.
11. Determination of pesticides and inorganic contamination from wastewater of chemical industry.
12. Identification and categorisation of industries in your area as red, orange and green.

**Environmental Management**

1. Demonstration on environmental and energy audit of a industry.
2. Demonstration on ISO: 14001, ISO:14004, ISO: 9001.
3. Demonstration on Total Quality Management in Industry.

**Industrial Safety**

1. Graphically highlight industrial clusters in the map of India and study their impacts on environment, economy and society.
2. Socio-economic survey on workers w.r.t. stress, fatigue, vibration in an industry.
3. Collection of data about safety measures, first aid practices in industry.
4. Demonstration on use of fire fighting equipments in an industry.
5. Demonstration on use of safety measures equipments in an industry.
6. Demonstration on common effluent treatment plant for treatment of heterogeous wastewater.
7. Pilot plant study on BOD and COD removal from sewage, industry waste by aeration.
8. Visit to sewage treatment plant for study of working units and maintenance.

**Sustainable Environment**

1. Demonstration on environmental accounting of profit loss balance sheet.
2. Demonstration on environmental ethics.
3. Case study for PBR of Mendha Lekha village.
4. Study and demonstration on schematic layout of open space, garden in city, design aspect of new garden.

**Environmental Engineering**

1. Calculation and design of sedimentation tank, clariflocculator, aeration tank, ASP, TF, Disinfection Process, Sanitary Landfills, ESP, and Cyclone.
2. Treatability studies using the activated carbon for the removal of metals, uses of local adsorbent viz. rice husk, brick, and fly ash and evaluation of the absorption capacity using Langmuir or Freundlich adsorption isotherm.

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## Project Work Instructions for Students

(Total marks: 100. Project work: 80 marks, internal: 20 marks)

Candidates will write a dissertation on issues related to Environmental Science under the guidance of their respective guides. Each student will work independently on the topic. The dissertation must consist of review of literature and produce a deep insight of the subject on the basis of personal research.

Dissertation work will be initiated at the start of M.Sc. II year (IIIrd semester). The students will undertake field work in terms of collection of data and surveys. The dissertation will have to be submitted for appraisal and acceptance by the University to the concerned college. The students should submit their dissertation in the following format.

**Chapter I: Introduction with Aims and Objectives:** A background with historical information and a review of existing material or data on the subject along with the aims and objectives of the study.

**Chapter II: Methodology with Material and Methods:** Description of the issue, methodology adopted for the study.

**Chapter III: Experimental:** Presentation of data collected and detailed analysis of results.

**Chapter IV: Result and Discussion:** Discussion on the data and results obtained and presentation of method suggested to solve the problem.

**Chapter V: Summary and Conclusions:** A summary of the dissertation and important conclusions drawn at the end of the investigation.

**Bibliography or References:** A list of references of cited in the text.

The dissertation should be typed on A4 size bond paper with 1.5 line spacing. Illustrations and photographs should be of high quality. The report should be flawless without any spelling mistakes or grammatical errors. Students will have to submit their dissertation one month before the final practical examination at the end of M.Sc. II year (IVth semester).

The dissertation will carry 100 marks. Assessment of the dissertation will be done at the end of the year. Students have to present a Power Point Presentation. Assessment of the dissertation shall be done by the external examiner appointed by the Gondwana University, Gadchiroli.

### A) Industrial training

Students are encouraged to undergo summer/winter in plant training in a suitable industry so as to get firsthand experience of corporate environmental management.

### B) Study visits

- i) National Environmental Engineering Research Institute (NEERI), Nagpur
- ii) Remote Sensing Center, Nagpur
- iii) Regional Meteorological Center, Nagpur
- iv) Maharashtra Pollution Control Board, Nagpur
- v) Industrial visits

**C) Seminar**

Student may select any environmental related topic of their choice (in consultation with the faculty) and make a power point presentation for 30 minutes. They shall be able to answer questions invited from the audience.

**D) Field diary**

The student shall prepare their field diary under the following heads

- i) Issue on local/regional/national problem of environmental interest (Case Studies).
- ii) About famous personalities in environmental movements.
- iii) New Acts and Judgments of environmental interests.

**E) Guest lecture series**

In each year guest lectures will be given by the faculty and other invited speakers on current topics and environmental issues. The course would run as a guest lecture series (at least five guest lecturers in chosen topics) with compulsory attendance.

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**Gondwana University, Gadchiroli**  
**Model Question Paper (Theory)**

**M. Sc. Environmental Science**

**Time: Three Hours**

**Maximum Marks: 80**

- |                                   |          |
|-----------------------------------|----------|
| Q. 1: Long Question from unit I   | 16 marks |
| OR                                |          |
| a) Short Question from unit I     | 08       |
| b) Short Question from unit I     | 08       |
| <br>                              |          |
| Q. 2: Long Question from unit II  | 16       |
| OR                                |          |
| a) Short Question from unit II    | 08       |
| b) Short Question from unit II    | 08       |
| <br>                              |          |
| Q. 3: Long Question from unit III | 16       |
| OR                                |          |
| a) Short Question from unit III   | 08       |
| b) Short Question from unit III   | 08       |
| <br>                              |          |
| Q. 4: Long Question from unit IV  | 16       |
| OR                                |          |
| a) Short Question from unit IV    | 08       |
| b) Short Question from unit IV    | 08       |
| <br>                              |          |
| Q. 5: Short Answer questions      | 4x4 = 16 |
| 1) From unit I                    |          |
| 2) From unit II                   |          |
| 3) From unit III                  |          |
| 4) From unit IV                   |          |

**The End**