

**B.Sc. II year Environmental Science
Semester III**

**Gondwana University, Gadchiroli
Semester Pattern Syllabus for
B. Sc. II year, Semester III
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)	
1 Two experiments	20 marks (10 marks each)
2 Certified practical record book	04 marks
3 Certified tour report/field diary	03 marks
4 Viva-voce	03 marks
Total 30 marks	

GONDWANA UNIVERSITY, GADCHIROLI

Faculty of Science

B. Sc. II year Semester III and IV Environmental Science

Year	Semester	Paper	Paper title	Marks		Total Marks	Total Marks
				Theory	Internal		
B.Sc. II Year	III	I	Pollution Science	50	10	60	150
		II	Natural Resources and GIS	50	10	60	
		Practical	Practical	30	-	30	
	IV	I	Pollution Control Technologies	50	10	60	150
		II	Forest & Wildlife	50	10	60	
		Practical	Practical	30	-	30	

Note: The Syllabus is based on 6 theory periods per week and 6 practical periods per week per batch.

Semester III
Paper I
Pollution Science

Unit I : Air Pollution

1. Basics of Air Pollution : Sources. Classification of air pollutants: particulate matter, hydrocarbon, carbon monoxide, carbon dioxide, oxides of sulphur, oxides of nitrogen. Primary and secondary air pollutants. Criteria pollutants.

2. Problems of Air Pollution: Smog forming reactions and its effects on environment. Air pollution episodes: London and Los Angeles smog. Acid rain: causes, effects and control. Vehicular pollution: principle pollutants, effects and control.

3. Air Pollution and Meteorology: Factors influencing air pollution. Primary and secondary meteorological parameters. Pressure system and dispersion. Winds and dispersions. Moisture and dispersion.

Industrial air pollution: Principle causes of industrial pollution. Point and non point sources of air pollution. Air pollution problems of some industries: thermal power plant, pulp and paper industry, mining industry and cement industry.

Case Study: Bhopal Gas Tragedy.

Unit II: Water Pollution

1. Basics of Water Pollution: Water resources. Definition of water pollution. Types of water pollutants. Sources and effects of water pollution. Surface water pollution and groundwater pollution.

2. Thermal Pollution: Definition. Process. Sources and effects on environment. Environmental issues associated with coal ash (ecosystem and man).

Oil pollution: Definition, sources, effects on marine life, birds and man. Ballast water.

3. Metal and Other Pollution: Trace metals, light metals and heavy metals. Chemical speciation of mercury. Minimata episode—biological methylation of mercury. Biochemical effects of cadmium. Arsenic contamination in groundwater. Nitrate in groundwater and blue baby syndrome. Fluoride in groundwater and effects on human being.

Case study: Effects of thermal power plant on environment and on a river water quality.

Unit III: Noise and Radiation Pollution

1. Noise pollution: Definition. Sources. Measurement of noise pollution: the Decibel scale. Equipments used for noise measurement. Causes of traffic noise. Effects on human beings: auditory and non-auditory.

2. Radiation pollution: Basic types of radiation. Sources. Units of radiation. Damages caused by radiation. Radioactive fallout: mechanism and types. Nuclear winter. Cell phone radiofrequency radiation and mobile phone towers.

3. Occupational health hazards: Types of hazards. Hazards in mining activities, pulp and paper industry and cement industry. Difficulties due to poor illumination, ventilation, working at elevated places, overhead equipments handling, vibration causes of accidents.

Case Study: Atom bomb disaster in Hiroshima and Nagasaki; Chernobyl–world’s worst nuclear disaster.

UNIT IV: Soil and Pesticide Pollution

1. Soil Pollution: Definition, causes and sources. Agricultural practices. Chemical and metallic pollutants. Mining and soil sediment.

2. Soil Contamination: Major routes of contamination of soil. Acidification. Salination. Detrimental effects of soil pollutants. Effects of industrial pollutants, sewage and domestic waste, heavy metals, modern agro-technology, diseases caused by soil pollutants.

3. Pesticide Pollution: Sources. Persistent organic pollutants (POP's), distribution. Effects of pesticides on man, animals, birds, aquatic biota. Bioaccumulation and biomagnification of pesticides. Mode of poisoning.

Case study: Comparative study of organic and artificial farming soil for soil and pesticide pollution.

WWW.oxpof.com

Semester III
Paper II
Natural Resources and GIS

Unit I: Energy Resources and Conservation

- 1. Natural Resources:** Definition. Classification. Non-renewable energy resources (coal, oil, natural gas and nuclear energy). Renewable energy resources (solar, wind, hydro energy, tidal, OTEC, geothermal). Formation and method of obtaining energy. Bio energy: biomass-method of energy conversion, Biogas: process. KVIC digester for biogas generation and its modification.
- 2. Future Energy:** Sources of energy and fuel in future-Hydrogen. Alcohol—as a source of energy, bio-fuel, alcohol blended petrol, bio-diesel: production methods.
- 3. Energy Conservation:** Energy conservation measures in domestic and industrial establishment. Impacts of non-renewable and renewable energy on environment.

Case study: In the map of your district mark various types of natural resources.

Unit II: Earth's Water and Land Resource

- 1. Water Resource and its Management:** Source of water supply. Man's water requirement. Causes of wastage, and degeneration of fresh water resources. Watershed management, concept, macro and micro watershed and significance. Big dams: controversies of big dam. Construction of low cost dam viz- *Vanrai, Kolhapuri*, mesh protected stone bund for irrigation and their advantages and disadvantages, significance.
 - 2. Rainwater Harvesting:** Aims and objectives. Roof top rainwater harvesting: conservation, details of pit, selection of sand media, quality of pit outlet, construction of pit in agriculture land for water storage
 - 3. Land Resources:** Existing scenario of utilisation of land for infrastructure development. Issues regarding acquisition of land for special economic zone (SEZ). Reasons for loss of soil and degradation.
- Management of Land Resource:** Integrated land use policy of India. Wasteland development measures. Bio-fertilizer technology for fertility of soil. National Wasteland Development Board (NWDB).

Case study: Construct a rain water harvesting system for college/home.

Unit III: Natural Catastrophes and Disaster Management

- 1. Natural Catastrophes:** Definition. Types: tsunami, drought, cloud bursting, hurricanes, cyclones, avalanche. Description of phenomenon and their effects.
- 2. Risk Assessment:** Prediction, magnitude of problem, assessment of disaster. Warning and evacuation. Consolidated preparation for next disaster. Disaster mitigation mapping: natural and manmade hazards analysis and mapping.

3. Disaster Management: Disaster preparedness. Disaster mitigation programmes in India. Rescue and relief operation. Risk mitigating strategies. National Disaster Management Authority of India-its role and salient features.

Unit IV: Remote Sensing and GIS

1. Remote Sensing: Definition. Concept of remote sensing. Development of remote sensing. Emission of electromagnetic radiation (EMR). Use of microwave for remote sensing.

2. Image Processing: Digital image processing. Digitisation procedure, image restoration. Spectra of environmental components: spectral characteristic of earth feature (vegetation, soils, reflectance of rocks, water).

3. RS & GIS and Environmental Management: Definition. Components of GIS. GIS process system. Role in pollution monitoring, forest cover, earthquake, landslide, nuclear, chemical and measuring wetland loss.

Books for Reference:

1. Ecology and Environment- P.D. Sharma, Rastogi Publication, 2001.
2. Environmental Biology and Toxicology- P.D. Sharma, Rastogi Publication, 2004.
3. Animal Ecology and Environmental Biology- H.R. Singh, Vishal Publication.
4. Animal Physiology and Ecology- P.S. Varma, V.K. Agrawal, B.S. Tyagi, S. Chand, 2002.
5. Environmental Biology- P.S. Varma and V.K. Agrawal, S. Chand, 2001.
6. Ecology- E.P. Odum, Oxford and IBH Publishing.
7. Environmental Ecology- P.R. Yadav, Shubhrata R. Mishra, Discovery Publishing House, 2004.
8. Fundamentals of Environmental Biology- S. Arora, Kalyani Publishers, 1985
9. Plant Ecology and Soil Science- R.S. Shukla and P.S. Chandel, S. Chand Publication, 2001.
10. Environmental Management- Dr. Anand S. Bal, Himalaya Publication, 2009.
11. Maintaining Biodiversity in Forest Ecosystem- Malcolm L. Hunter Jr., Cambridge University Press, 1999
12. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology- P.S. Verma, V.K. Agarwal. S. Chand Publication, 2005.
13. Non Conventional Energy Sources- G. D. Rai, Khanna Publishers, Delhi
14. Environmental Science- W. Cunningham and Saigo, McGraw Hill, New York.
15. A Textbook of Environment- Agrawal, Mcmillan publication, Mumbai
16. Environmental Chemistry- S. S. Dara, S. Chand and Company, NewDelhi2002.
17. Environmental Chemistry- B.K. Sharma, Goel Publication, Meerut.
18. Air Pollution- M.N. Rao, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003
19. Air Pollution- A .C. Stern
20. Environmental Problems and solution- Asthana, S. Chand and Company, New Delhi.
21. Environmental Science- S. C. Santra, New Central Book Agency private Limited, 2006.
22. Fundamental Concepts of Environmental Chemistry- G. S. Sodhi, Narosa Publishing House, New Delhi, 2002
23. A Textbook of Environmental Science- R.N. Trivedi, Anmol Publications Private Limited, 1997

24. Man and Environment- P. R. Trivedi, Gurdeep Raj, Akshadeep Publishing House, New Delhi, 1997.
25. Fundamental Concepts in Environmental Studies- Dr. D. D. Mishra, S. Chand Publication, 2009.
26. Environmental Chemistry- A. K. De, New Age International Publishers, 2001.
27. Industrial Safety and Environment- Anupama Prasar. S. K .Kataria & Sons, Delhi
28. Environmental Chemistry- P. S. Sandhu, New Age International Publishers, Mumbai
29. Environmental Engineering- Gerard Kiely, The McGraw-Hill Company
30. Environmental Science and Engineering- J Glynn Henry and G W Heinke, PHI Learning Private Limited

www.oxpdf.com

Semester III Practical

Section A: Pollution Science

1. Analysis of settleable particulate matter by Dust fall jar method.
2. Determination of relative humidity by psychrometer.
3. Determination of wind speed and direction by cup shaped anemometer.
4. Identification of point and non point sources of pollution in the region.
5. Analysis of surface water quality for effective chlorine dosages (free chlorine).
6. Analysis of ground water quality for pH, TDS, Iron and fluoride for potability.
7. Analysis of water supply for potability test with respect to pH, hardness, alkalinity, acidity, free chlorine and disease causing organisms.
8. Effect of thermal pollution study of water body with respect to temperature, dissolved oxygen, viscosity, pH and conductivity.
9. Analysis of rainwater for pH, conductivity, hardness and acidity.
10. Pilot plant study of rainwater harvesting pit (construction, analysis of water samples).
11. Analysis of rainwater harvesting pit for drinking water quality parameter-pH, acidity, alkalinity, hardness, solids and fluoride.
12. Analysis of fly ash leachate with respect to silica and fluoride.
13. Construction of bricks by fly ash.
14. Determination of the noise levels in residential, commercial, industrial and silence zones and its comparison with the National Ambient Air Quality Standards with respect to Noise.
15. Demonstration on occupational hazards in Industry w.r.t temperature, light, vibration and ventilation.
16. Critical study of special economic zone (SEZ) concept with respect to National and International context.
17. Detection of Ni^{2+} , Co^{2+} and Cu^{2+} in a given mixture by paper chromatography.

Section B: Planktonology and Natural Resources

1. Sampling techniques for planktons and their preservation.
2. Identification of phytoplankton's.
3. Identification of zooplanktons.
4. Quantitative estimation of phytoplankton's by Sedgwick Rafter cell method.
5. Quantitative estimation of zooplanktons by Sedgwick Rafter cell method.
6. Measurement of solar constant.
7. Soil, rain and agro-climatic zone of Maharashtra.
8. National parks in Maharashtra.
9. Mining resources of Maharashtra.
10. Types of forests in Maharashtra.