



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

M.Sc. (Zoology) Programme

Subject Code& Name: - MS02EZOO01 – Environmental Biology and Toxicology

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				Internal		External	
L	T	P	Total	TH	PWE	TH	PWE
2	--	2	4	25%	25%	25%	25%

Programme Name	M.Sc. Zoology
Semester	II
Course Code	MS02EZOO01
Course Title	Environmental Biology and Toxicology
Course Content Type (Th./Pr.)	Theory
Course Credit	4
Sessions+ Lab. Per Week	2+2
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Upon completion of the course, students will be able to:

- Understand environmental processes, ecosystem functioning, and the impact of pollutants on biological systems.
- Apply environmental monitoring and toxicological assessment techniques for pollution management and environmental protection.

Prerequisites (if any)

- Basic knowledge of Ecology, Environmental Science, and Animal Physiology.
- Understanding of Cell Biology, Biochemistry and Genetics.
- Familiarity with laboratory techniques and basic biostatistics.

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Explain ecological processes, environmental pollution, and toxicological principles affecting living organisms.
- Assess environmental quality and toxic effects using biological, chemical, and ecological indicators. Apply environmental monitoring, toxicity testing, and risk assessment approaches for environmental management and conservation.



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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Fundamentals of Environmental Biology • Environment: Concept, components, and scope • Ecosystem structure and function • Energy flow and biogeochemical cycles • Population, community, and ecosystem ecology • Biodiversity and ecosystem services • Environmental issues: climate change, ozone depletion, acid rain, desertification Environmental Pollution and Monitoring • Air, water, soil, thermal, noise, and radioactive pollution • Sources, transport and fate of pollutants • Environmental quality standards • Biomonitoring and bioindicators • Environmental Impact Assessment (EIA) • Environmental management and sustainability	15
II	Principles of Toxicology • Introduction, Scope and basic divisions of toxicology. • Environment, Toxicants and toxicology, Factor affecting the environmental concentrations of toxins, Dose, Effect and response and Statistical concept of toxicology. Toxicants of Public health hazards: • Black lists, Toxic chemicals, Pesticides, Automobile emission, Heavy Metals, Fertilizers, Food Additives and Adulterants • Radioactive substances, and its biological effects. Ecotoxicology and Environmental Health • Ecotoxicology: concepts and applications • Heavy metals, pesticides, plastics, pharmaceuticals, and emerging pollutants • Bioaccumulation, biomagnification, and bioconcentration • Environmental legislation: • Environment (Protection) Act, 1986, Water Act, 1974 and Air Act, 1981 • Hazardous Waste Management • Sustainable development and pollution mitigation strategies	15



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List of Practical (Practical are demonstrated using charts, models and multimedia videos)

1. Estimation of free CO₂ from given water sample
2. Estimation of chloride content from given water sample
3. Estimation of phosphate content from given water sample
4. Estimation of Sulphur content from given water sample
5. Estimation of total hardness from given water sample
6. Estimation of DO from given water sample
7. Estimation of BOD from given water sample
8. Analysis of soil characteristics (pH, moisture, organic carbon)
9. Toxicity assessment using LC50 data (demonstration/data analysis)
10. Biomonitoring studies using aquatic organisms and indicator species
11. Demonstration of spectrophotometric analysis in environmental studies
12. Demonstration of wastewater treatment processes
13. Demonstration of environmental monitoring instruments
14. Visit to a wastewater treatment plant, industrial area, wetland, river ecosystem or pollution monitoring laboratory
15. Collection and analysis of environmental samples

30 hours

Text Book(s)

1. Environmental Biology by P.D. Sharma; Rastogi Publications, Meerut.
2. Ecology and Environment by P.D. Sharma; Rastogi Publications, Meerut.
3. Environmental Studies by Erach Bharucha; Universities Press, Hyderabad.
4. Environmental Biology and Toxicology by A.K. De; New Age International Publishers, New Delhi.
5. Fundamentals of Ecology and Environmental Biology by R.K. Trivedi & P.K. Goel, Avishkar Publishers.
6. Environmental Science by S.C. Santra, New Central Book Agency, Kolkata.
7. Environmental Pollution and Control Engineering by C.S. Rao, New Age International Publishers.



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Reference Books

1. Environmental Chemistry, A.K. De; New Age International Publishers.
2. Environmental Pollution, V.K. Ahluwalia; The Energy and Resources Institute (TERI), New Delhi.
3. Environmental Toxicology, Satake M. & Mido Y.; Discovery Publishing House, New Delhi.
4. Environmental Biotechnology, B.D. Singh, Kalyani Publishers, Ludhiana.
5. Fundamentals of Environmental Pollution, Krishnan Kannan, S. Chand Publishing.
6. Principles and Methods of Toxicology, A. Wallace Hayes, CRC Press.
7. Casarett and Doull's Toxicology: The Basic Science of Poisons, Curtis D. Klaassen, McGraw-Hill Education.
8. Ecotoxicology: The Study of Pollutants in Ecosystems by F. Moriarty, Academic Press.
9. Introduction to Environmental Toxicology, Wayne G. Landis, Ming-Ho Yu & Lewis Roberts by CRC Press.
10. Environmental Toxicology and Chemistry, Donald G. Crosby, Oxford University Press.
11. Fundamentals of Ecotoxicology by Michael C. Newman, CRC Press.
12. Environmental Biology by Matthew R. Fisher, McGraw-Hill Education.
13. Environmental Science: Toward a Sustainable Future by Richard T. Wright & Dorothy Boorse, Pearson Education.

Web Resources

1. Ministry of Environment, Forest and Climate Change (MoEFCC): <https://moef.gov.in>
2. Central Pollution Control Board (CPCB): <https://cpcb.nic.in>
3. Gujarat Pollution Control Board (GPCB): <https://gpcb.gujarat.gov.in>
4. National Green Tribunal (NGT): <https://greentribunal.gov.in>
5. National Biodiversity Authority (NBA): <https://nbaindia.org>
6. Forest Survey of India (FSI): <https://fsi.nic.in>
7. ENVIS Centre: <https://www.envis.nic.in>
8. National Environmental Engineering Research Institute (NEERI): <https://www.neeri.res.in>

Required Software(s) (if any)

L:: Lecture, **T::** Tutorial, **P::** Practical

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

