**University of Gondar**

**Institute of Biotechnology**

**Department of Environmental Biotechnology**

**Course outline for Environmental Biotechnology (Biot. 621)**

1. **Course Identification**

**Course Title :** Environmental Biotechnology

**Course Code :**Biot. 621

**Credit Hours :** 3 credit hours/week (2 hours lecture+1 hour lab)

**Program :** M. Sc.

1. **Instructor’s Contact Information**

**Name:** Dr.Nega Berhane

**Designation:** Professor of Biotechnology

**Office:** Institute of Biotechnology 2nd floor

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1. ­­­­­­­­­­­­­­­­­­­­**Course Description**

This course is meant at providing in understanding of the theory and practice of genetics and molecular biology approaches to the environmental and ecological research problems. Topics supposed to be covered in this course include: molecular genetics and biological concepts along with the techniques employed. Practical work provides basic experience of the laboratory procedures and some of the major techniques.Moreover, the course also covers Advantages and limitations of organism typing, Phylogenetic analysis, Mating practices, Biodiversity, Pollution monitoring and the role of genetic engineering in Bio monitoring and Bioremediation, Microbial ecological studies using FISH, and DNA fingerprinting approaches. Environmental microbiology: Extremophiles and their applications. Compositing, Bioremediation, Biodegradation of xenobiotic, Wastewater treatment, Biological nutrient removal, Microbial energy conversions, Pollution control biotechnology.

1. **Course Objectives:**

At the end of this course, students will be able to:

* List environmental problems posed by human and natural phenomena.
* Explain the methods used for removal of pollutants and wastes from the environment using biological methods.
* Describe the use of eco-friendly methods to maintain the environment clean and restore the degraded lands.
* Illustrate Biotechnological methods involved in treatment of waste water.

1. **Course Content:**
2. Environment: Basic concept and issues, global environmental problems- Ozone depletion, UV-B, Greenhouse effect and Acid rain.
3. Environmental Pollution: Sources of pollution, methods of measurement of pollution, fate of pollutants in the environment, Biomagnification, Bioindicators.
4. Air Pollution and its control through Biotechnology.
5. Water Pollution and Its Control: Water as a scarce natural resource, Need for water management, Measurement of water pollution, sources of water pollution, waste water treatment: Physical, chemical and biological treatment processes. Biological nutrient removal and recovery.
6. Microbiology of waste water treatments:Aerobic process: Activated sludge, Oxidation ponds, trickling filter.
7. Anaerobic Processes: Anaerobic digestion, anaerobic filters, upflow anaerobic sludge blanket reactors.Thermophilic and Mesophilic Operation
8. Treatment schemes for waste waters of dairy, distillery, tannery, sugar, antibiotic industries.Environmental Monitoring, Biosensors.
9. Biodiversity: Biotechnological applications in conservation
10. Xenobiotic Compounds: Bioremediation of xenobiotics in environment, Biomining.
11. Bioremediation of contaminated soils and waste land. Soil Remediation and Disposal, Biological Processes, Biological *Ex Situ* Processes, Biological *In Situ* Processes
12. Solid Wastes: Sources and management (Compositing, Vermiculture and Methane production).Fundamentals of Composting Process.
13. Role of Immobilized cells/enzymes in treatment of toxic compounds.
14. **Course Evaluation:**
15. Assignment ………….. 10%
16. Presentation …………. 10%
17. Mid Sem. Exam …….... 30%
18. Final Exam …………... 50%
19. **References:**
20. Gareth M. Evans Judith C. Furlong, 2003. Environmental Biotechnology: Theory and Application. John Wiley and Sons Ltd.
21. Roger PermanYue Ma James McGilvray Michael Common, 2003. Natural Resource and Environmental Economics. Pearson Education Limited.
22. Singh, Y. K. 2006. Environmental Sciences, New Age International Pub.
23. Pradipta Kumar Mohapatra, 2007. Environmental Biotechnology, I.K. International Publishing House; 1st Ed. edition.
24. Selected review papers and Hand outs.