

Biological Treatment Processes (ENCE 701B/489B), UMBC, Fall 2003

Instructor: Dr. Upal Ghosh, Department of Civil and Environmental Engineering (ughosh@umbc.edu)



Secondary clarifiers in a wastewater treatment plant



Land biotreatment operation at Milwaukee Harbor

Course Brief: This course will provide students with the fundamental and design aspects of biological treatment processes. The course will focus on engineered biological treatment for both municipal wastewater systems and contaminated soils and sediments. An understanding of biological treatment operations requires knowledge in the fundamental areas of microbiology, biochemistry, mass transport, reaction kinetics, and reactor engineering. The main objective of this course is to closely integrate the theoretical and design aspects of biological treatment processes such that underlying principles form the basis of engineering design. The following subsections will be covered in the course.

1. Overview of biological treatment processes and environmental applications.
2. Fundamentals of environmental microbiology and biochemistry.
3. Energy generation and utilization in biological systems.
4. Quantitative description of biological growth and degradation.
5. Bioreactor design for wastewater treatment processes (activated sludge, attached growth)
6. Nitrogen and phosphorus control.
7. Bioremediation of contaminated soils and sediments.
8. In-situ bioremediation: state of art and challenges.
9. New frontiers of bioremediation.

Suggested Texts:

1. Wastewater Engineering - Treatment Disposal Reuse, Metcalf & Eddy, McGraw Hill, 1991.
2. Environmental Biological Principle and Application by Rittman and McCarty, Latest Edition, McGraw-Hill publisher, 2001.
3. In Situ Bioremediation: When does it work? National Research Council, National Academy Press, Washington, D.C. 1993.

Grading: Homework 20%; Report/Presentation 20%; Midterm 30%; Final 30%

Weekly Homework: Weekly homework problems will be assigned to the class, which will be due in a week. All homework assignments must be turned in to pass this course. Late work will not be graded. Homework solutions will be posted on the class website.

Report/Presentation: A 10-page report will be due on the last day of classes. Topic selection can be related to any application related to the course. Some recommended topics will be announced in the class. Each student will have to give a 15-minute of oral presentation in the last week of classes. The report will account for 10% of total grade and oral presentation will account for 10% of total grade.

Test Policy: The midterm and final exams will cover both theory and applications taught in the class.

A course website will be available at: <http://userpages.umbc.edu/~ughosh/>