

ENVIRONMENTAL BIOTECHNOLOGY FOR WASTE MANAGEMENT

ABE 4932 Section EBTE

Class Periods: Monday, Wednesday, Friday, Period 6, 12:50 PM – 1:40 PM

Location: Frazier Rogers 211

Academic Term: Spring 2026

Instructor:

Dr. Pratap Pullammanappallil

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Office Hours: Monday, Wednesday, Friday, 1:45 PM – 2:45 PM, 203 Frazier Rogers Hall

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- None

Course Description

The course will introduce biological processes employed for the treatment of agricultural, municipal, industrial and agro-processing residues and wastes. It will include biological, physical and chemical principles related to characterization and analysis of pollutants, biological and physico-chemical transformation of pollutants, and engineering principles for design and operation of treatment systems. The course will focus on analysis and design of activated sludge, nutrient removal, anaerobic digestion and composting systems. 3 credits (Spring)

Course Pre-Requisites / Co-Requisites

4 or higher classification courses in Biological, Chemical or Environmental Engineering

Course Objectives

The objectives of the course are to develop principles and concepts related to biological transformations of organic compounds and apply these to the design and operation of activated sludge, nutrient removal and anaerobic digestion systems. Specific objectives are to:

- Learn about laboratory techniques for measuring dry matter, volatile matter, ash, carbonaceous, nitrogenous and phosphorous compounds in wastes and wastewater.
- Develop stoichiometry of biological reactions
- Quantify the kinetics of microbial transformations
- Understand the principles of bioreactor design and operation
- Characterize the processes occurring in activated sludge, nutrient removal, and anaerobic digestion systems
- Design activated sludge and nutrient removal bioreactors for wastewater treatment
- Design and understand operation of anaerobic digesters for wastewater and solid waste treatment
- Learn about biogas cleanup and utilization
- Analyze economics of anaerobic digestion processes
- Learn about the microbial process and feedstock requirements for composting organic matter.
- Design composting systems.

Materials and Supply Fees

None

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- None

Course notes developed by the instructor will be posted on e-learning site

Recommended Materials

- Title: **Environmental Biotechnology- Principles and Applications**
- Author: Bruce E. Rittman and Perry L. McCarty
- Publication date and edition: 2001, First
- ISBN number: 0072345535

Required Computer

Recommended Computer Specifications: <https://it.ufl.edu/get-help/student-computer-recommendations/>
 HWCOE Computer Requirements: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

Course Schedule

Weeks 1-2	CHARACTERIZATION AND ANALYSIS OF WASTES <ul style="list-style-type: none"> • Proximate Analysis • pH, alkalinity, solubility, redox potential • Organic compounds • Nutrients (nitrogen and phosphorous) • Microbial pathogens • Heavy metals 	Homework sets 1,2 Exam 1
Weeks 3-5	PRINCIPLES OF BIOLOGICAL WASTE TREATMENT <ul style="list-style-type: none"> • Introduction • Microbiology Basics • Stoichiometry • Microbial kinetics 	Homework sets 3,4 Exam 1

Weeks 6-9	<ul style="list-style-type: none"> • Biofilm kinetics BIOLOGICAL WASTEWATER TREATMENT SYSTEMS <ul style="list-style-type: none"> • Activated Sludge Process • Nitrification/Denitrification systems • Phosphorous Removal 	Homework sets 5,6, 7 and 8 Exam 2
Weeks 9-12	ANAEROBIC DIGESTION <ul style="list-style-type: none"> • Introduction • Microbial processes • Types of anaerobic digesters • Operating considerations • Design of anaerobic digesters • Biogas cleanup • Economics of anaerobic digestion 	Homework sets 9 and 10 Exam 3
Weeks 13-15	COMPOSTING <ul style="list-style-type: none"> • Introduction • Microbial processes • Types of composting systems • Operating considerations • Design of in-vessel composters 	Homework sets 11 and 12 Exam 3

Important Dates

<i>Feb, 11, 2026, Wednesday</i>	<i>Exam 1 (Take-home)</i>
<i>Mar 25, 2026, Wednesday</i>	<i>Exam 2 (Take-home)</i>
<i>Apr 29, 2026, Wednesday</i>	<i>Exam 3 (Take-home)</i>

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (12)	100 each	25%
Exam 1	100	25%
Exam 2	100	25%
Exam 3	100	25%
		100%

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: <https://go.ufl.edu/syllabuspolicies>. Instructor-specific guidelines for courses must accommodate these policies.

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu