BIOPROCESS ENGINEERING

ABE 4932 SECTION BIOP

Class Periods: Tuesday, Period 4 (10:40 AM – 11:30 PM); Thursday, Period 4-5 (10:40 AM – 12:35 PM)

Location: Frazier Rogers Hall 283

Academic Term: Fall 2026

Instructor

Dr. Pratap Pullammanappallil
(352) 294 6719
pcpratap@ufl.edu

Office hours: Wednesdays 10:00 AM -12:00 noon in 203 Rogers Hall or by appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student

None

Course Description

The course will cover engineering principles, processes and techniques for using biological agents such as cells, enzymes or antibodies for the production of chemicals, food, biofuels and pharmaceuticals, and waste treatment. The course will include stoichiometry and kinetics of reactions that employ biological agents; and design, analysis and operation of reactors (fermentors). 3 credits (Fall)

Course Pre-requisites/ Co-requisites

Life Sciences, Biological, Chemical or Environmental Engineering coursework

Course Objectives

The objectives of the course are to develop concepts and mathematical tools required to understand and analyze

- biological processes involved in production of chemicals, food, biofuels and pharmaceuticals using biological agents.
- Stoichiometry and kinetics of microbially mediated processes
- design and operation of reactors utilizing biological agents

Material 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	
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 and inclusive 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

a. Title: Bioprocess Engineering Principles
b. Author: Pauline M. Doran
c. Publisher: Academic Press, 2012 (Second Edition)
d. ISBN-13: 978-0-12-220851-5 (paperback)

Recommended Reading

a. Bioreaction Engineering Principles, John Villadsen, Jens Nielsen and Gunnar Lidén, Third Edition 2011, Springer
b. Bioprocess Engineering – Basic Concepts, Shuler, Kargi and DeLisa, Third Edition 2017, Prentice Hall

Course Schedule

Week 1: Introduction
Week 1 and 2: Bioprocess Engineering Examples/Homework set 1/Exam 1
Week 3: Stoichiometry and energetics of microbial growth and product formation/ Homework set 2/Exam 1
Weeks 4, 5 and 6: Material and Energy Balances/ Homework sets 3 and 4/Exam 1
Week 7: Principles of Enzyme Catalysis/ Homework set 5/Exam 2
Week 8: Cell Growth and Kinetics / Homework set 6/Exam 2
Week 9: Analysis of mixed cultures/ Homework set 7/Exam 2
Week 10: Immobilized cells / Homework set 8/Exam 2
Week 11: Metabolic Engineering/Homework set 9/Exam 3
Week 12: Operating considerations - Bioreactor modes of operation/ Homework set 10/Exam 3
Week 13: Operating considerations -Agitation, Aeration and Heat transfer/ Homework set 11/Exam 2
Week 14: Operating considerations -Nutrient requirements
Week 15: Operating considerations -Sterilization / Homework set 12/Exam 3

Important Dates

September 24 2026, Thursday	*Exam 1 (10:40 AM – 12:40 PM, 283 Rogers)*
October 29 2026, Thursday	*Exam 2 (10:40 AM – 12:40 PM, 283 Rogers)*
UF Calendar Final exam date	*Exam 3 (2 hours, Time and date as specified in UF calendar)*

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 (Tentative and subject to change)

Percent	Grade	Grade Points
93.0 - 100	A	4.00
90.0 – 92.9	A-	3.67
85.0 - 89.9	B+	3.33
80.0 - 84.9	B	3.00
75.0 - 79.9	B-	2.67
70.0 - 74.9	C+	2.33
65.0 – 69.9	C	2.00
60.0- 64.9	C-	1.67
55.0- 59.9	D+	1.33
50.0- 54.9	D	1.00
45.0 – 49.9	D-	0.67
0 – 44.9	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