

ROWAN UNIVERSITY
DEPARTMENT of CHEMICAL ENGINEERING

Course

CHE 06.462 1, Bioprocess Engineering
CHE 06.510 1, Biochemical Engineering
T 6:30 PM – 9:00 PM (ROW340)

Instructor

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office hours as posted

Course Description

This course reviews the fundamentals and engineering of bioprocess engineering with emphasis on applying biotechnology to industrial processes. Essential aspects of biochemistry, microbiology, and kinetics are presented. This course discusses bioreactor engineering, and recovery and purification processes. Processing applications of engineering kinetics and enzyme technology are included. Laboratory experiments and demonstrations will be integrated throughout the course.

Prereqs: Chemistry I (CHEM 06.100) or Advanced College Chemistry 1 (CHEM 06.105), Calculus I (MATH 01.130)

Text

“Bioprocess Engineering: Basic Concepts, 2nd edition,” M.L Shuler and F. Kargi, Prentice Hall PTR, Upper Saddle River, NJ 2002

Handouts and selected readings as provided

WebCT for online material, homework solutions, and “muddiest point” discussions

Objectives

1. Categorize chemical products produced through biological reactions
2. Explain the differences between bacterial, fungal, plant, and animal cells
3. Explain the biological use of the four classes of biopolymers present in cells
4. Outline the general flow of material and energy in metabolism
5. Determine rate and equilibrium constants for enzyme kinetics
6. Describe the nutritional needs of cells during growth
7. Determine rate and equilibrium constants for cell growth and product formation
8. Model cell, substrate, and product concentration in batch and continuous bioreactors
9. Correlate oxygen mass transfer in a bioreactor to mixing characteristics (bubble size, power input, impeller type, etc.)
10. Describe the general sequence of steps in bioproduct recovery
11. Describe the separation mechanism for the most common bioseparations
12. Produce and purify a recombinant protein in the laboratory

Content

<u>Week</u>	<u>Dates</u>	<u>Book Chapter</u>	<u>Topic</u>
1	09-04	1 & A	Introduction to Bioprocess Engineering
2	09-11	2 & 4	Biological Background
3	09-18	3	Enzyme Kinetics
4	09-25	5 & 7	Microbial Growth – Metabolism & Stoichiometry
5	10-02		Exam 1 on 10-02-07
6	10-09	6.1 – 6.3	Microbial Growth – Batch Reactor Kinetics
7	10-16	6.4 & 9	Microbial Growth – Continuous Reactor Kinetics
8	10-23	10	Bioreactor Design and Analysis
9	10-30		Exam 2 on 10-30-07
10	11-06		No class – Election Day
11	11-13	11	Product Recovery & Project Setup
12	11-20		Project Work
13	11-27		Project Work
14	12-04		Project Work
15	12-11		Discussion of Projects
16	12-??		Exam 3 during finals week
			<i>(specified final exam time TBA during Final Exam week 12-17 to 12-21)</i>

Topics/Exam times may shift due to time constraints

Grading Policy

Course is graded on a percentage scale (e.g. 93+% = A, 90-93% = A-, etc.)

Homework done on team basis, graded (4,3,2,1,0) for each problem

Exam 3 is held in Final Exam period and represents the last “component” of course

Extra credit granted for posting to the “muddiest point” discussions on WebCT

Each week you post, you get 0.1% added to final course grade (maximum 1.0%)

Individual scores on team-based items will be modified using Felder’s “Peer Rating of Team Members” form

CHE 06.462 1 (undergraduate)

Exam 1 = 25%, Exam 2 = 25%, Exam 3 = 30%, Homework = 20%

Project may also be completed – must decide before week 7

If Project grade exceeds Exam 1/2 grade, Project grade replaces lowest exam grade

CHE 06.510 1 (graduate)

Exam 1 = 20%, Exam 2 = 20%, Exam 3 = 30%, Homework = 10%, Project = 20%

Project

Production and purification of a recombinant protein in the laboratory

Further description in a future document

Grading will be based upon laboratory write-up

Team / individual with best score on “production rubric” guaranteed an A on project

Attendance

Attendance is consistent with University policy

Professionalism

Responsibilities: To succeed in this class, you should come to class prepared, ask questions on points that you do not understand, and attempt all homework problems. In this class, if you have not worked diligently on the homework assignments, don't follow what is covered in class, and do not read the book (including the examples/exercises that are in the book), the tests will be difficult. Doing only one third of the homework problems and not reading the book while your teammates do the work is a recipe for disaster in this course. I will lecture on material (that covered in the book and some not), make myself available for questions both in and out of class, attempt to answer all serious questions, and administer fair but demanding exams.

Policies:

1. Regular attendance is expected. You are responsible for all material whether you are in class or not.
2. Late work of any kind will not be graded, you have multiple team members – one must be able to hand in the work for the group on time.
3. Collaboration in study teams for homework is acceptable and encouraged, but all tests must be done independently.
4. If you feel that a test problem has been graded improperly (except for miscalculation of points), you must resubmit the problem within 24 hours along with a written appeal and explanation. Upon receipt of this formal appeal, I will regrade the problem. This means that your score may go up or down.
5. Academic dishonesty of any kind will result in failure for the course. Academic dishonesty includes, but is not limited to, copying on an exam, submitting work performed by another as your own, tampering with or in any way altering another persons work without their knowledge and consent, and misrepresenting your contribution to a group project.

Your academic success is important. If you have a documented disability that may have an impact upon your work in this class, please contact me. Students must provide documentation of their disability to the Academic Success Center in order to receive official University services and accommodations. The Academic Success Center can be reached at 856-256-4234. The Center is located on the 3rd floor of Savitz Hall. The staff is available to answer questions regarding accommodations or assist you in your pursuit of accommodations. We look forward to working with you to meet your learning goals.