

Catalog Data: CHEN 282. Chemical Engineering Biology (3-0). 3 Credits.

Instructor: Mariah Hahn, Room JEB 227, Email: mhahn@tamu.edu
Class: TR 8:00 –9:15 AM, Civil Engineering Lab Building 419

Office Hours:
1) MW 9-10 AM
2) By appointment

Teaching Assistant
Rebecca McMahon (rebecca.erin.mcmahon@gmail.com)
Office Hours: T 5-6 PM

Textbook: Brock Biology of Microorganisms, 12th Edition (e-book chapters only)

Textbook: Bioprocess Engineering, 2nd edition, M. L. Shuler and F. Kargi

Course Prerequisites: Eligible for upper division classes in Chemical Engineering

Course Objectives: By the end of the course, you should be able to do the following things:

- **Define fundamentals of cellular organization and structure.** Recognize cellular diversity and classifications. Define biological macromolecules and their role in cellular function. Recognize cells are “biological industries”
- **Describe structure-function relationships of macromolecules.** Describe DNA and proteins as building blocks of cellular function. Discuss structural aspects of DNA and proteins and their relationship to function.
- **Define how cells function.** Define central dogma of biology and the genetic code. Recognize control of cellular function, metabolism and bioenergetics. Demonstrate knowledge of simple growth and enzyme kinetics.
- **Describe manipulation of cellular function.** Describe manipulation of biomacromolecules. Discuss genetic engineering basics. Recognize function can be engineered by altering building blocks.
- **Identify design principles for engineering specific biotechnology applications.** Describe design principles underlying biotechnology and bioprocess applications.

Course Outline: (Number of lectures)

I. Fundamentals of Biology & Biotechnology

1. Introduction to course, overview of biotechnology (1)
2. Cells, Biomolecules, and Enzymes (2)
3. How do cells work? (2)
4. Metabolism and Bioenergetics (1)

Exam I

II. Engineering principles in Biotechnology

5. How do cells grow? (2)
6. Stoichiometry of growth and product formation (2)
6. Enzyme kinetics (3)
7. Bioreactor design and operation (3)

Exam II

III. Molecular Biotechnology

9. How to measure biomolecules? (2)
10. How to manipulate biomolecules and engineer cellular behavior? (2)
11. Applications/Case studies (2)

Exam III

Final Exam (Cumulative)

Course Policies and Procedures:

• Changes in schedule

The instructor reserves the right to change the order and content of lectures as necessary. Exam dates may be changed by the instructor, but in each case, at least 5 days notice will be given.

• Examination policy

There will be two mid-term exams (during class hours) and a final exam. You are expected to take examinations when offered. Makeup exams will be given only for documented illnesses or University excused absences. You will be given zero credit for additional examinations that are missed. There will not be makeup quizzes for missed ones.

Exam 1 (20%)

Exam 2 (20%)

Exam 3 (20%)

Final (30%)

Homework (10%)

• Homework policy

Each student will be expected to complete the homework individually. For each submission, the due dates will be announced in class. On the due date, you must turn in your homework at the beginning of the class. Late homework will be accepted only *if prior approval has been obtained* and will also be subject to penalty.

• Attendance. Attendance is strongly suggested though not enforced. Please come on time.

• Academic Integrity. Aggie Honor Code: “An Aggie does not lie, cheat, or steal or tolerate those who do.” Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: www.tamu.edu/aggiehonor/

• Disabled Students. The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Cain Hall, Rm. 118 or call 845-1637.

Relationship of course to program outcomes (*Criterion 3*)

Course Outcomes	ChE Program Outcomes
<p>Define fundamentals of cellular organization and structure</p> <ul style="list-style-type: none"> • Recognize cellular diversity and classifications. • Define biological macromolecules and their role in cellular function. • Recognize cells are “biological industries” 	1, 5
<p>Describe structure-function relationships of macromolecules</p> <ul style="list-style-type: none"> • Describe DNA and proteins as building blocks of cellular function. • Discuss structural aspects of DNA and proteins and their relationship to function. 	1, 5
<p>Define how cells function</p> <ul style="list-style-type: none"> • Define central dogma of biology and the genetic code. • Recognize control of cellular function, metabolism and bioenergetics. • Demonstrate knowledge of simple growth and enzyme kinetics. 	1, 5, 11
<p>Describe manipulation of cellular function</p> <ul style="list-style-type: none"> • Describe manipulation of biomacromolecules. • Discuss genetic engineering basics. • Recognize function can be engineered by altering building blocks. 	10, 11
<p>Identify design principles for engineering specific biotechnology applications.</p> <ul style="list-style-type: none"> • Describe design principles underlying biotechnology applications such as tissue engineering, drug delivery, bioremediation, and bioprocesses. 	1