

Microbiology for Engineers

CHEE 477R-001 & CHEE 577R-001, 3 units, Fall 2017

Syllabus

Instructor:

Dr. Jim A. Field

Department of Environmental and Chemical Engineering, University of Arizona

Room 208, Engineering building, tel. 520-621-0704

Email: jimfield@email.arizona.edu

Teaching Assistants:

Chi Huynh Nguyen

Office: Harshbarger building 118C

Email: chihuynhnguyen@email.arizona.edu

Alvaro Simon Pascual

Office: Engineering 157, tel. 621-6457

Email: asimonpascual@email.arizona.edu

Office Hours

Teaching Assistants (Chi or Alvaro):

Venue: Harshbarger 112

Monday 1:00-2:00

Wednesday 12:00-1:00

Lecturer (Dr. Jim A. Field):

By prior appointment (jimfield@email.arizona.edu) in Engineering 208

Lecture Venue and Times:

Venue: Haury Anthropology Bldg, Room 216, (<http://ctsrooms.arizona.edu/rooms/330>)

1009 E South Campus Dr

When: Tues and Thurs from 11:00 AM-12.15 PM

Course Description:

This course focuses on the principles of microbiology, including physiology, metabolism, genetics and ecology. The course explores fundamental microbial processes as well as their environmental significance and application in environmental engineering.

Course Objectives

- 1) Students will become literate in biology
- 2) Students will learn the common macromolecules of biological systems
- 3) Students will be able to make quantitative analysis of biological systems
- 4) Students will have a fundamental background in biochemistry
- 5) Students will have a fundamental background in molecular biology and gene regulation
- 6) Students will become familiar with microbiology applied to environmental technology and biotechnology

Learning Flow Table

Learning Objectives	Literacy and Background	Quantitative	Application & Design
Learning Activity:	Lectures & Reading	Lectures & In Class Exercises	Lectures, Reading & Technology Examples
Assessment:	Terminology and Concepts tested in HW, Exams &	Mathematical problems in HW, Exams & Quizzes	Simple design challenges in HW & Exams
Use in Career:	Participate and understand biotechnology projects	Perform basic engineering calculations in biotechnology projects	Design solutions applied to engineering problems concerning biological systems

Text Book:

Brock Biology of Microorganisms, 15th edition, Madigan MT et al. Pearson Education Inc., 2018. ISBN-13: 9780134261928

OR

Brock Biology of Microorganisms, 14th edition, Madigan MT et al. Pearson Education Inc., 2015. ISBN 0-321-89739-0

Course Web Site: => D2L

Reading Assignments

Most lectures will have an associated reading assignment. The assignment should be completed before the lecture. The Reading Assignments are posted in D2L class Contents. The assignments are provided for both the 15th and the 14th editions of the textbook, depending on which version you have.

In Class Exercises

In class exercises are given in selected lectures to have you practice concept. They are not graded so you do not need to turn them in. If you miss a class, the In Class Exercises can be downloaded from the class Content page

Homework

- Homework will be assigned on the date of the lecture
- Homework assignments and answer keys can be downloaded from the class content page
- Keys are made available so you can confirm that you are doing the homework correctly
- There is no need to turn in the Homework Assignments.
- Instead, mastery of homework and class attendance will be tested with **in class pop quizzes** that will occur on unannounced dates (shortly after homework due dates).
- You are responsible for doing the homework and attending class so that you will do well on the **in class pop quizzes**.
- Please bring calculator to every class (to solve math problems on pop quizzes)

Class attendance

Class attendance is required.

Pop quizzes will be used to monitor your class attendance

Extra Credit Quizzes

Each lecture will have several **on line extra credit quizzes** available under Heading “Quizzes” in main menu of D2L.

You will have up until next exam to take the quizzes on line at your leisure

You will get the highest score of a maximum of two attempts

After the first attempt you will be informed which answers were wrong

If you want to review quizzes after you taken them, please take screen shots of them to save them to study them again

Bioethics Assignment

Students will receive a short assignment on bioethics, which involves selecting a topic in bioethics, finding appropriate literature to learn about and subsequently writing a one to two page report defining the issue and advocating for one side of the issue.

Grading:

Grading is based on performance in homework, quizzes midterm exam, and final exam

Course Element	Percent Grade
Homework and Class Attendance	15% (in class pop quiz, closed book) [†]
Bioethics Report	5% (report)
Exam 1	25% (closed book)
Exam 2	25% (closed book)
Final exam	30% (closed book)
On Line Extra Credit Quizzes	+5% (open book)

[†]The lowest three in class pop quiz grades will be excused

Academic Integrity

Cheating or aiding in cheating on pop quizzes, exams and homework will not be tolerated.

Plagiarism will also not be tolerated. Please refer to the university policy on academic integrity:

http://deanofstudents.arizona.edu/codeofacademicintegrity#academic_integrity_procedures

Lecture Notes:

Pdf copies of the Lecture notes can be downloaded at D2L site in the Content page (there are two formats 2 slides per page or 1 slide per page)

Lecture Program

Course Overview and Introduction	Metabolism
Molecular Logic of Life	Microbial Growth Kinetics
Cells	Bacterial Genetics
Physiology and Ecology	Regulation
Macromolecules	Anaerobic Processes
Cell Membranes	Bioremediation
Cell Wall	Pathogens
Stoichiometry and Nutrition	
Bioenergetics	

Class Schedule 2017

week	date	day	Lecture	Lecturer	Lecture#
week 01	22-Aug	T	Course Overview and Introduction	Field	Lec1
	24-Aug	H	Molecular Logic of Life	Guest	Lec2
week 02	29-Aug	T	Cells	Field	Lec3
	31-Aug	H	Phylogeny and Classification	Field	Lec4
week 03	5-Sep	T	Physiology and Ecology	Field	Lec5
	7-Sep	H	Extremophiles	Field	Lec6
week 04	12-Sep	T	Macromolecules part 1	Field	Lec7
	14-Sep	H	Macromolecules part 2	Field	Lec8
week 05	19-Sep	T	Cell Membranes & Cell Walls	Field	Lec9
	21-Sep	H	Stoichiometry	Field	Lec10
week 06	26-Sep	T	Review exam1	Field	Rev1
	28-Sep	H	Exam 1		
week 07	3-Oct	T	Bioenergetics	Field	Lec11
	5-Oct	H	Metabolism 1	Field	Lec12
week 08	10-Oct	T	Metabolism 2	Field	Lec13
	12-Oct	H	Kinetics	Field	Lec14
week 09	17-Oct	T	DNA Replication	Field	Lec15
	19-Oct	H	DNA Transcription, mRNA translation	Field	Lec16
week 10	24-Oct	T	Mutations and Natural Genetic Exchange	Field	Lec17
	26-Oct	H	Molecular Biology Tools	Field	Lec18
week 11	31-Oct	T	Molecular Biology Tools pt 2	Field	Lec18b
	2-Nov	H	Review exam2	Field	Rev2
week 12	7-Nov	T	Exam 2		
	9-Nov	H	Regulation	Field	Lec19
week 13	14-Nov	T	Molecular Fingerprinting	Field	Lec20
	16-Nov	H	Pathogens (and Bioethics assignment)	Field	Lec21
week 14	21-Nov	T	Time set aside to work on bioethics	Field	
	23-Nov	H	No Class, Thanksgiving day	Field	
week 15	28-Nov	T	Anaerobic Processes	Field	Lec22
	30-Nov	H	Bioremediation Primer	Field	Lec23
week 16	5-Dec	T	Review Final	Field	Rev3&4
	11-Dec	M	Final Exam (10:30 am – 12:30 pm)		