

Microbiology for Engineers

CHEE 477R-001 & -911 CHEE 577R-001, 3 units, Fall 2015

Syllabus

Instructor:

Dr. Jim A. Field

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Teaching Assistants:

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Office Hours

Teaching Assistant: Emily Orenstein

Venue: Harshbarger 112

Monday 1:00-2:00

Wednesday 12:00-1:00

Lecturer, 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, 14th edition, Madigan MT et al. Pearson Education Inc., 2015. ISBN 0-321-89739-0

OR

Brock Biology of Microorganisms, 13th edition, Madigan MT et al. Pearson Education Inc., 2012. ISBN 0-321-64963-X

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 the class Contents under the heading Reading Assignments

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 (unless they are associated with a survey). 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 can be downloaded from the class content page (D2L) under the heading: Homework Assignments

Homework will be turned in on the due date at the start of the lecture (HW sent via email will not be graded)

Late homework will not be accepted unless an agreement was made from beforehand or illness or family emergency

Homework must be done individually and independently

Homework answers are either right or wrong, partial credit will only be given in special cases.

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.

Extra Credit Quizzes

Each lecture will have several quizzes available under Heading “Quizzes”.

You will have up until next exam to take the quizzes

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 take them, please take screen shots of them to save them to study them again

Grading:

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

Course Element	Percent Grade
Homework	10.0% (open book)
Bioethics Report	2.5% (report)
Exam 1	27.5% (closed book)
Exam 2	27.5% (closed book)
Final exam	32.5% (closed book)
Extra Credit Quizzes	+5% (open book)

Academic Integrity

Cheating or aiding in cheating on 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 2015

week	date	day	Lecture	Lecturer	Lecture#
week 01	25-Aug	T	Course Overview and Introduction	Field	Lec1
	27-Aug	H	Molecular Logic of Life	Field	Lec2
week 02	1-Sep	T	Cells	Field	Lec3
	3-Sep	H	Phylogeny and Classification	Field	Lec4
week 03	8-Sep	T	Physiology and Ecology	Field	Lec5
	10-Sep	H	Extremophiles	Field	Lec6
week 04	15-Sep	T	Macromolecules part 1	Field	Lec7
	17-Sep	H	Macromolecules part 2	Field	Lec8
week 05	22-Sep	T	Cell Membranes & Cell Walls	Field	Lec9
	24-Sep	H	Stoichiometry	Field	Lec10
week 06	29-Sep	T	Review exam1	Field	Rev1
	1-Oct	H	Exam 1		
week 07	6-Oct	T	Bioenergetics	Field	Lec11
	8-Oct	H	Metabolism 1	Field	Lec12
week 08	13-Oct	T	Metabolism 2	Field	Lec13
	15-Oct	H	Kinetics	Field	Lec14
week 09	20-Oct	T	DNA Replication	Field	Lec15
	22-Oct	H	DNA Transcription, mRNA translation	Field	Lec16
week 10	27-Oct	T	Mutations and Natural Genetic Exchange	Field	Lec17
	29-Oct	H	Molecular Biology Tools	Field	Lec18
week 11	3-Nov	T	Molecular Biology Tools pt 2	Field	Lec18b
	5-Nov	H	Review exam2	Field	Rev2
week 12	10-Nov	T	Exam 2		
	12-Nov	H	Regulation	Field	Lec19
week 13	17-Nov	T	Molecular Fingerprinting	Field	Lec20
	19-Nov	H	Pathogens (and Bioethics assignment)	Field	Lec21
week 14	24-Nov	T	Time set aside to work on bioethics	Field	
	26-Nov	H	No Class, Thanksgiving day	Field	
week 15	1-Dec	T	Anaerobic Processes	Field	Lec22
	3-Dec	H	Bioremediation Primer	Field	Lec23
week 16	8-Dec	T	Review Final	Field	Rev3&4
	14-Dec	M	Final Exam (10:30 am – 12:30 pm)		