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

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:
Emily Orenstein
Office: Harshbarger 118C
Email: eorenstein@email.arizona.edu

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

Text Book:


OR


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

<table>
<thead>
<tr>
<th>Course Element</th>
<th>Percent Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10.0% (open book)</td>
</tr>
<tr>
<td>Bioethics Report</td>
<td>2.5% (report)</td>
</tr>
<tr>
<td>Exam 1</td>
<td>27.5% (closed book)</td>
</tr>
<tr>
<td>Exam 2</td>
<td>27.5% (closed book)</td>
</tr>
<tr>
<td>Final exam</td>
<td>32.5% (closed book)</td>
</tr>
<tr>
<td>Extra Credit Quizzes</td>
<td>+5% (open book)</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Course Overview and Introduction</th>
<th>Metabolism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Logic of Life</td>
<td>Microbial Growth Kinetics</td>
</tr>
<tr>
<td>Cells</td>
<td>Bacterial Genetics</td>
</tr>
<tr>
<td>Physiology and Ecology</td>
<td>Regulation</td>
</tr>
<tr>
<td>Macromolecules</td>
<td>Anaerobic Processes</td>
</tr>
<tr>
<td>Cell Membranes</td>
<td>Bioremediation</td>
</tr>
<tr>
<td>Cell Wall</td>
<td>Pathogens</td>
</tr>
<tr>
<td>Stoichiometry and Nutrition</td>
<td></td>
</tr>
<tr>
<td>Bioenergetics</td>
<td></td>
</tr>
</tbody>
</table>
# Class Schedule 2015

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