Microbial Ecology

COURSE DESCRIPTION
Biodiversity and role of microorganisms in natural environments. Concepts of ecology applied to microorganisms; methods in microbial ecology; interactions of microbes with their living and non-living environment; microbial habitats and functions. Roles and regulation of microbes in natural and man-made environments, from cellular to community level. Unique abilities of microorganisms such as nitrogen fixation and adaptation to extreme environments.

LEARNING OUTCOMES
Upon completion of this course the student should be able to:

1. Students will be able to summarize the development of the field of microbial ecology and differentiate the roles of various groups of microbes in the ‘environment’.
2. Students will be able to describe the diversity and classification of microorganisms, particularly bacteria and Archaea.
3. Students will be able to explain and compare types of interactions between microbes and other organisms.
4. Students will be able to outline the effects of abiotic factors on survival and distribution of microorganisms
5. Students will be able to discuss current applications of microbes in areas of environmental concern.
6. Students will be able to perform methods used to study microorganisms from different environments and compose lab reports.
7. Critically analyze current literature relating to microbial ecology.
8. Students will research and design a laboratory experiment which they will explain and perform with the other students.
9. Students will develop leadership skills through group activities and presentations to the class.
10. Write a credible project summary styled in NIH or NSF formats

REQUIRED TEXT
FURTHER READINGS

- Primary literature as directed by instructor: student will be responsible for obtaining the assigned reading from the library or online database

Major Course Requirements

Supplies/materials required: Textbook, lab coat, safety goggles or glasses, lab notebook (scantrons when indicated)

Please wear lab coats, cover legs (no shorts), closed-toed shoes (no sandals, mules, Crocs®, flipflops, etc.). While you should have your own cloth lab coat, we may ask you to purchase disposable lab coats for three labs involving pathogens and blood. We also need you to have and wear when requested laboratory safety goggles (preferred) or safety glasses (adequate) for the pathogens and blood labs.

Lab Coordinator

Ms. Githzette M. Planas-Costas, M.S.                  CS 253                  Githzette.Planas@tamucc.edu

Laboratory component: Lab sections will be held in EN 301. Note that labs start the week of September 8 with Reinforced Lab Safety and familiarity; come prepared with: lab coat; closed-toe shoes, long pants.

Laboratory TA — Brittney Kosar

LAB SAFETY BRIEFINGS: You must participate in the Lab Safety Briefing, which is no longer on-line as SMTE 0091, but given the first day of class. Failure to attend will result in your dismissal from the lab.

Tentative Evaluation: Your final grade will be based on the percentage you earn out of the total possible points. Individual extra credit is not possible, but bonus points may be built into exams or other assignments. Statistical manipulations, if used (at the Instructor’s discretion), will be performed only once, at the end of the semester. A 10-point grading scale will be used:

A = 90 - 100 %
B = 80 - 89.9 %
C = 70 - 79.9 %
D = 60 - 69.9 %
F = 0 - 59.9 %

The time schedule may require adjustment. Should this be the case, the assignments and weighting may change. Additional assignments may or may not be provided at the Instructor’s discretion and depending upon opportunities. Such assignments might include seminar attendance, homeworks, group projects, reading assignments, quizzes, etc.

An assignment will likely be due during the last week of class.

Every attempt will be made to follow the time and evaluation schedules shown below. It is the student’s duty to attend each class session and be aware of all assignments, deadlines, changes, etc.
**GRADED ACTIVITIES--Evaluation**

Lecture—Three written exams will mostly consist of multiple-choice, but may also include a mixture of these plus short answer, essay, multiple choice, multiple-multiple matching, descriptive T/F PLUS a **cumulative final exam**

Grading scale: A>90%  B=80-89.9%  C=70-79.9%  D=60-69%  F<60%

**Lecture**

3 class exams @ 100 pts. each  = 300 pts max  
Cumulative final exam  = 200 pts  
Independent Reading reports  = 150 pts  
Topic Development & Project Summary  = 250 pts  
Quizzes and Homework  = will be factored in based on number given (given at prerogative of instructor)

**Lecture is 64.3% of total grade**

**Lab**—Lab notebook  = 200pts  
Lab report (manuscript format) assessment  = 50 pts  
Lab Leadership  = 200 pts  
Quizzes and Homework  = will be factored in based on number given (given at prerogative of instructor)  
Attendance  = 50 pts

**Lab is 35.7% of total grade**

**Extra credit assignments**

(given at prerogative of instructor; no alternatives)

To be announced

**Missed exams**—No make-up exams will be given, one exam can be dropped and replaced by the grade from the Cumulative Final Exam.

If the student is satisfied with their overall grade derived from lecture and laboratory standings without the inclusion of the cumulative final. The final can be excused. Consultation with the instructor must be obtained. Instructor will not assume that the student was content with the overall grade.

**Missed extra credit opportunities**—Instructor is not obligated to give make-up assignments for extra credit opportunities, whether excused or unexcused.
Student Led Discussion of Journals: Students will be matched into groups and groups are responsible for leading the discussion on primary journals

Quizzes may be given at any time in class. There will be no makeups. Homworks and other assignments may be given in class. The other assignments may include seminar attendance, data interpretation, experimental design, calculations, opinion papers, research article summaries, etc. They will generally be due at the start of lecture class the following week. You are encouraged to get together and work on them as a group. However, unless specified otherwise, the assignments must be turned in individually and be written in your own words, NOT COPIED. An assignment grade of ZERO will be given if the work is not in your own words.

SPECIAL ASSIGNMENTS

1. Students will be assigned lecture sections in which they will be required to direct the presentation of a Topic and Experimental Development. (100 pts)

2. Students will select a microbial pathogen listed in the syllabus and prepare a Project Summary addressing a mechanism of pathogenesis. The Project Summary (1.5 page maximum) describing the project in the language of the discipline. Include a statement of the research objective(s) and/or hypotheses and discuss the significance of the project to the advancement of knowledge in the field of microbial pathogenesis. Project Summary should be derived from published journals only. (150 pts)
READING REPORTS

We will discuss recent primary articles. This will be used to relate the material covered in class to current work in the field of microbial ecology. You are expected to read all articles prior to the assigned date. You will be required to submit a reading report summarizing the contents of each article. Reading Reports are due by the beginning of class on the assigned due date and should be submitted electronically (Late reports will NOT be accepted.

1. Provide the title, author(s), date and source of each reading.
2. Indicate the senior author's affiliation (e.g. Department of Microbiology and Molecular Genetics, Michigan State University).
3. Observation that led to research (look in abstract and introduction)
   a. Describe 2–3 observations.
4. Question (try rewording the title)
   a. Identify the model organism/system.
   b. State why the model is an appropriate choice.
   c. State why the question is important (what did the authors hope to learn about the field?).
5. Hypotheses (usually not stated but implied in abstract or introduction; look for phrases like “this research shows…”)
   a. Explain why these hypotheses make sense based on current knowledge (introduction).
6. Experiment (look at the figures to determine what they did)
   a. Choose 2–3 key figures that directly address the hypotheses.
   b. Restate the model organism/system (figure legend).
   c. Describe general experimental design; what was measured/compared and how?
   d. Describe the methods and controls (draw a flow diagram on the board when presenting).
   e. Explain why the choice of controls was appropriate.
7. Results (look at the figures first)
   a. Explain figures clearly; restate what is being compared to what for each one.
   b. Look for trends; e.g., What is increased over what?
   c. Identify the controls and how they validate the trends.
   d. Look for statistical analyses (figure legend or results) that validate the data.
8. Conclusion (based on the data, not on the discussion)
   a. Does the data support the hypotheses?
   b. Are there other possible explanations for the data?
   c. Is the data convincing (stats)?
   d. How could the experiment be improved?
   e. Why is the data interesting; how does it contribute to our understanding of the field?
Each group will develop a PowerPoint presentation in IMRaD format.

Rubric--Power Point Presentations
Peer Reviewer Name: ____________________________
Reviewers: Please total the points and place at the listed spot at the end of the rubric.

Group Topic: ______________________________
Directions: Score as follows: 0= Missing 1= Poor 1.5= Suboptimal 2= Fair 3= Good 4= Very Good 4.5= Excellent 5= Flawless
Format
1. Students have slides with consistent format, background, and color scheme ______
2. Narrative slides are legible and do not have too many words/facts on a single slide ______
3. Narrative slides contain tables, figures, and graphs that help to tell the story ______
4. Graphs/tables are clear, concise and accurate with correctly-labeled axes, labels ______
5. Order of presentation tells a clear, logical story of the information presented. ______

Content
1. Students had sufficient knowledge about area of presentation. ______
2. Students understood area well enough to explain content. ______
3. Students presented scientific content in a coherent fashion. ______
4. Students cited/acknowledged work done by others. ______
5. Students integrated references into topic. ______

Oral Presentation of Power Point Presentation
1. Presenters spoke in an adequate amount of time to allow a clear understanding. ______
2. Presenters gave presentation in IMRaD form ______
3. Presenters clearly articulated major points of the work. ______
4. Presenters gave a talk that was concise in describing work presented. ______
5. Presenters gave a talk that was relatively free of grammatical errors. ______
6. Presenters adequately handled questions at the end of the presentation. ______
7. Presenters spoke without many pauses, giggles, “uhhs,” “you knows,” and “likes.” ______
8. Presenters exhibited professionalism in making presentation. (Not Strict on Attire) ______
9. Presenters gestured to words/graphics. ______
10. Presenters talked to audience, not to wall, slides, or inanimate objects. ______

Peer Reviewer Total Points: ______
<table>
<thead>
<tr>
<th>Lecture Topic</th>
<th>Class title</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction to microbial ecology</td>
<td>Barton &amp; Northup: Chapter 1</td>
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<tr>
<td>2</td>
<td>Scale and scope of the microbial world</td>
<td>Barton &amp; Northup: Chapter 1</td>
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<tr>
<td>3</td>
<td>Domains of life and species concepts</td>
<td>Barton &amp; Northup: Chapter 2</td>
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<td>4</td>
<td>Growth in the laboratory vs. growth in nature</td>
<td>Barton &amp; Northup: Chapter 3</td>
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<td>5</td>
<td>Factors influencing population density and survival</td>
<td>Barton &amp; Northup: Chapter 3</td>
</tr>
<tr>
<td>6</td>
<td>Microbial habitats and Population dynamics</td>
<td>Barton &amp; Northup: Chapter 4</td>
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<td>7</td>
<td>Role of gene transfer in reproduction and disease</td>
<td>Barton &amp; Northup: Chapter 4</td>
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<td></td>
<td><strong>Exam I</strong></td>
<td>Group Reading Report: 09/19/2014</td>
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<tr>
<td>8</td>
<td>Research in microbial ecology</td>
<td>Barton &amp; Northup: Chapter 5</td>
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<td>9</td>
<td>Biotechnology and investigative methods in microbial ecology</td>
<td>Barton &amp; Northup: Chapter 5</td>
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<td>10</td>
<td>Interaction among microbes</td>
<td>Barton &amp; Northup: Chapter 6</td>
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<td>11</td>
<td>Symbiosis and syntrophy</td>
<td>Barton &amp; Northup: Chapter 6</td>
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<td>12</td>
<td>Microbial communities and ecosystems- I</td>
<td>Barton &amp; Northup: Chapter 7</td>
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<td>13</td>
<td>Microbial communities and ecosystems- II</td>
<td>Barton &amp; Northup: Chapter 8</td>
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<td>14</td>
<td>Microbial communities and ecosystems- III</td>
<td>Barton &amp; Northup: Chapter 9</td>
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<td><strong>Exam II</strong></td>
<td>Reading Report I&amp;II: 10/13&amp;10/20</td>
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<td>15</td>
<td>Nutrient Cycles: Carbon &amp; Nitrogen</td>
<td>Barton &amp; Northup: Chapter 10</td>
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<tr>
<td>16</td>
<td>Nutrient Cycles: Sulfur, Phosphorus, &amp; Iron</td>
<td>Barton &amp; Northup: Chapter 10</td>
</tr>
<tr>
<td>17</td>
<td>Microbes at Work: student selected topics</td>
<td>Barton &amp; Northup: Chapter 11-13</td>
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<tr>
<td>18</td>
<td>Group Presentations</td>
<td>Reading Report III 11/24/2014</td>
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<td><strong>Exam III</strong></td>
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<td>12/01/2014</td>
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<td>19</td>
<td>Final Review</td>
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<td>12/03/2014</td>
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<td><strong>Exam IV, Final</strong></td>
<td>CS-101</td>
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<td>12/08/2014</td>
<td>1:45 pm– 4:15 pm</td>
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REQUIRED UNIVERSITY POLICIES
Students with Disabilities and Veterans: All programs in Life Sciences (LSCI) comply with the federal Americans with Disabilities Act (ADA) of 1990, including the ADA Amendments from 2008 (PL 110-325). This anti-discrimination statute provides civil rights protection for persons with disabilities. This statute requires that all qualified students with disabilities be guaranteed a learning environment that provides reasonable accommodations of their disabilities. This act also includes returning veterans who may be experiencing cognitive, emotional and/or physical access issues in the classroom or on campus. If you are a returning veteran or you suspect that you may have a disability requiring accommodation, please contact the Office of Disability Services (located in Driftwood 101) at (361) 825-5816. Please contact this office in a timely manner, as they must review requests and prepare accommodations and send the accommodation letters.

If you need disability accommodations in this class, please contact the instructor as soon as possible. If you have mobility problems, are pregnant, or you may have a history of seizures, please notify the instructor PRIVATELY so that assistance can be given in case of fire drills or emergencies. Please have your Faculty Notification Letter from the Disabilities Service Office when you talk with the Instructor.

GRADE APPEALS
A student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details on the process, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult Texas A&M University-Corpus Christi University Procedure 13.02.99.C2.01

Student Grade Appeal Procedures (http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage (http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school or the College of Science and Engineering Dean’s Office.

Academic Advising: The College of Science and Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. The College's Academic Advising Center is located in Center for Instruction--Suite 350, and can be reached at (361) 825-6094.

CLASS POLICIES
Attendance: Students are expected to attend every scheduled class and laboratory meeting. It is the responsibility of the student to obtain any material missed during an absence from his/her classmates. Power Points are not placed in the library, and only Power Points from certain sections will be placed on Blackboard™ 9.1, or on a website. For labs, the instructor (TA) should be notified PRIOR to lab if the student will be absent (except in emergency situations). Students must attend the laboratory section for which they originally registered. “Make-up” by attending other lab sections is NOT permitted except in emergencies, only with prior approval.

Academic Integrity: TAMUCC academic policies are in force, including standards for academic integrity & honesty, plagiarism, grammar and spelling. All policies are described in the TAMUCC catalogue and the Code of Conduct in the Student Handbook. DO NOT SHARE WRITTEN INFORMATION BETWEEN PARTNERS ON LAB REPORTS, AND PLACE THIS IN YOUR LAB NOTEBOOKS! THIS IS PLAGIARISM, AND YOUR TA WILL AWARD ALL OFFENDING PARTIES A ZERO ON THE ASSIGNMENT! We also have to report all instances of cheating to the Dean of Students office on an Academic Misconduct form.

Citation format: Please use Council of Science Editors format. If you don’t know this, ask someone in Pro Skills! A useful link on this format is available at this URL: http://writing.wisc.edu/Handbook/DocCSE.html

Professional Courtesy: DO NOT USE CAMERA PHONES IN LECTURE OR LAB. DO NOT SEND TEXT MESSAGES DURING CLASS. Please turn off all cell phones, beepers, Bluetooth devices, Palm Pilots, Black Berries, etc., before entering the classroom or laboratory, or at least place them on silent mode. I would prefer that earpieces not be worn in lecture or laboratory. DO NOT TAKE PHOTOS of Power Point slides or videos with your cell phone camera unless otherwise instructed. Recording of lectures with tape recorders can only be done with permission of instructor.
Classroom Behavior: “Texas A&M University- Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior (including excessive text messaging) may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.”

List-serve: All students are on the Blackboard list serve for the course, and to a second opportunities-list serve. To subscribe, send a separate e-mail to opportunities-list-request@sci.tamucc.edu. Make sure that your e-mail appears in the “From” heading. In the subject heading, type “subscribe,” then send the e-mail. Next, you will receive a second message with a long set of letters and numbers in the subject line. You must also reply to that message in order to be subscribed to the list-serve.

After the initial message to subscribe, to send items on the list-serve, just type opportunities-list@sci.tamucc.edu (do NOT add –request after list). You may not receive the messages from the list-serve if your Internet service provider (Yahoo, Hotmail, Excite, Roadrunner, Grande, etc.) keep these messages from being placed in junk-mail. The University administration prefers that you use the islander.tamucc.edu accounts.

At the end of the course, send an e-mail that contains your e-mail address in the “From” heading to opportunities-list@sci.tamucc.edu. In the subject heading, type the word “unsubscribe,” then send the e-mail. I hope that students will continue to subscribe to opportunities-list@sci.tamucc.edu!

Dropping courses: I hope that students do not find it necessary to drop this class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. You as adults have to be the final judge of your action whether to drop or not. For students applying to professional or graduate school, you will have to explain why you dropped this class or any other class. Receiving a “W” is NOT automatic; you must initiate the paperwork in the Student Services Center (the “Round Building”). Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class.

Deadline to drop course with a “W” grade: November 7
Deadline to withdraw from University for the fall term: December 1