MICROBIAL DIVERSITY AND ECOLOGY (BIOL 4408)
Department of Life Sciences
Fall 2015

A. COURSE INFORMATION
   Course number/section: BIOL 4408.001 (lecture); BIOL 4408.101 & 4408.102 (labs)
   Class meeting time: M & W 2:00PM – 3:15PM
   Class location: EN 107
   Course Website: https://bb9.tamucc.edu/ (Blackboard Sign In page)

B. INSTRUCTOR INFORMATION
   Instructor: Dr. Brandi Kiel Reese
   Office location: 105 Science Lab 1
   Office hours: M, T, W, & R, 8:30-9:30 AM and by appointment
   Co-Instructor: Dr. Jeffrey Turner
   Telephone: (361) 825-3022
   E-mail: brandi.reese@tamucc.edu
   Appointments: Made at least 24 hrs in advance by phone or e-mail

C. COURSE DESCRIPTION
   Catalog Course Description (http://catalog.tamucc.edu/mime/media/9/886/2014-2015+Graduate+Catalog.pdf): 4 semester hours (2:2) Biodiversity and roles of microorganisms in natural environments. Interactions with other micro- and macro-organisms (humans, animals and plants) and with abiotic factors. Unique abilities of microorganisms such as nitrogen fixation and adaptation to extreme environments.

   Extended Course Description
   Microbial roles in freshwater, marine, and terrestrial ecosystems will be studied. Emphasis is placed on the metabolic diversity of specialized microbial communities found in natural habitats. Microbial function in natural and constructed degradation or remediation processes will be examined from an ecological perspective. Microbial ecology encompasses aspects of microbiology relating to environmental research. Applied environmental microbiology is a discipline being sought in fields relating to water quality, water treatment, bioremediation technology, and bioengineering. This course will provide an excellent foundation for specific research in the area of environmental microbiology. An advancement of knowledge in this area will also complement other disciplines in ecology or environmental engineering.

D. PREREQUISITES AND COREQUISITES
   Prerequisites
   Biology I (BIOL 1406)
   Biology II (BIOL 1407)
   Microbiology (BIOL 2421)
Corequisites
None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook

Optional Textbook(s) or Other References
3. Scientific journal publications as assigned

Supplies
Should possess lab coat and protective eye-wear for when working with chemicals.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes, students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Students will demonstrate through examinations and discussion groups their advanced understanding of environmental microbiology structures and their functional roles in multiple ecosystems.
2. Students will be able to list and describe the methods used in environmental microbial studies. Through this, a better understanding of proper interpretation of data will be achieved.
3. Describe, using examples, how advances in the field of microbial ecology are tied to technological advances.
4. Discuss the theories for, and evidence in support of, the evolution of diversity among the bacteria and archaea, and describe how new, uncultivable microbes are identified and taxonomically categorized.
5. Students will lead discussion groups and participate in the critical analysis of primary scientific publications.
6. Describe the adaptations associated with growth in environments of extreme pH and temperature, as well as nutrient-poor (oligotrophic) conditions and how extremozymes may be characterized and synthesized.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

The course will be taught through traditional lectures with laboratory exercises that review and emphasize the lecture material. In addition, there will be a class project that will run in conjunction with the weekly Lab exercises in which all students will participate in the collection, processing, and analysis of environmental samples culminating in a scientific paper. This project will allow students to learn first-hand how to design and implement a project to better understand the microbial ecology of a natural system.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The learning outcomes stated earlier will be assessed through a variety of methods as noted in the following table.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>10</td>
</tr>
<tr>
<td>Exams (2)</td>
<td>40</td>
</tr>
<tr>
<td>Adopt-a-Microbe Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Term Paper</td>
<td>15</td>
</tr>
<tr>
<td>Final Exam*</td>
<td>25</td>
</tr>
</tbody>
</table>

*Entry to the classroom will be closed on the day of final exam soon as the first student to complete an exam has left the room. Students absent or arriving after room closure will receive a zero for the exam.

Grading: There will be a total of three (3) written exams. Exams may be composed of any, or all, of the following: multiple choice, matching, fill in the blank, problem solving and short essay. The final exam is a comprehensive exam. All exams count toward your class grade. No exam grade will be dropped. No make-up exams will be given. If an exam is missed with proper prior notification, the test may be taken as soon as possible after the exam date, but no later than the following class day. If the exam is not taken a grade of zero (0) will be entered. No extra credit assignments will be given. There will be a class project that occurs outside of the normal classroom meeting time, which will be graded through participation and a writing assignment based on the semester-long lab project due at the end of the semester (style will be discussed in class). Class attendance and participation will be assessed through in-class quizzes and paper discussions, which will also be factored into your final grade.

The grading scale is: A=90-100%, B=80-89%, C=70-79%, D=60-69%, and F=0-59%. All grades will be rounded to the nearest whole number, therefore, a grade of 89.50% would be
rounded to 90% (A) and a grade of 89.49% would be an 89% (B). **Last day to withdraw** from class with a "W" is Friday, November 6, and **must be done by the student.**

I. **COURSE CONTENT/SCHEDULE**

**Unit 1: Introduction to Microbial Diversity**

<table>
<thead>
<tr>
<th>Week #</th>
<th>Start Date</th>
<th>Topic</th>
<th>Readings/Assign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/26</td>
<td>Introduction</td>
<td>Ch. 1 - 2</td>
</tr>
<tr>
<td>2</td>
<td>8/31</td>
<td>Microbial Growth and Activity; Biomass/Biogeography* In class paper discussion</td>
<td>Ch. 5 Whitman, 1998*; Kallmeyer, 2013*</td>
</tr>
<tr>
<td>3</td>
<td>9/7</td>
<td>(Labor Day: No class); Metabolism</td>
<td>Ch. 3</td>
</tr>
<tr>
<td>4</td>
<td>9/14</td>
<td>Microbial Evolution/Systematics; Metabolic Diversity</td>
<td>Ch. 12 - 13</td>
</tr>
<tr>
<td>5</td>
<td>9/21</td>
<td>Bacterial/Archaeal Diversity; Exam 1* *September 23 and will cover Unit 1</td>
<td>Ch. 15 - 16</td>
</tr>
</tbody>
</table>

**Unit 2: Methods**

<table>
<thead>
<tr>
<th>Week #</th>
<th>Start Date</th>
<th>Topic</th>
<th>Readings/Assign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>9/28</td>
<td>Microscopy; Culture Dependent</td>
<td>Chap 18, Sect 1 and 2</td>
</tr>
<tr>
<td>7</td>
<td>10/5</td>
<td>Culture Independent: Molecular, Genomics/Transcriptomics</td>
<td>Chap 18, Sect 3</td>
</tr>
<tr>
<td>8</td>
<td>10/12</td>
<td>Microbial Activity* *In class paper discussion, paper TBD</td>
<td>Chap 18, Sec 4</td>
</tr>
</tbody>
</table>

**Unit 3: Biogeochemical Cycles**

<table>
<thead>
<tr>
<th>Week #</th>
<th>Start Date</th>
<th>Topic</th>
<th>Readings/Assign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>10/14</td>
<td>Photosynthesis/Oxygen Cycle</td>
<td>Ch. 20 and Ch. 14</td>
</tr>
<tr>
<td>9</td>
<td>10/19</td>
<td>Nitrogen Cycle; Metals/Sulfur Cycle</td>
<td>Ch. 20 and Ch. 14 Supplemental: Kirchman Ch. 13-15</td>
</tr>
<tr>
<td>10</td>
<td>10/26</td>
<td>Carbon Cycle; Heterotrophy</td>
<td>Ch. 20 and Ch. 14 Supplemental: Kirchman Ch. 5-6</td>
</tr>
<tr>
<td>11</td>
<td>11/2</td>
<td>Other Metabolisms/Mixotrophs; Extremophiles* *In class paper discussion, paper TBD</td>
<td>Ch. 20 and Ch. 14 Supplemental: TBD</td>
</tr>
</tbody>
</table>
Unit 4: Microbial Ecosystems

<table>
<thead>
<tr>
<th>Week #</th>
<th>Start Date</th>
<th>Topic</th>
<th>Readings/Assign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>11/9</td>
<td>Exam 2; Picoeukaryotes/Fungi</td>
<td>Ch. 17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*November 9, will cover Units 2 and 3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>11/16</td>
<td>Viruses; Microbial Ecosystems</td>
<td>Ch. 9-10; Ch. 19</td>
</tr>
<tr>
<td>14</td>
<td>11/23</td>
<td>Microbial Food Webs; Microbial Symbioses</td>
<td>Ch. 22</td>
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<tr>
<td></td>
<td>11/30</td>
<td>Presentations</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(No class on Dec 2)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>12/7</td>
<td>Final Exam: 1:45 p.m. – 4:15 p.m.</td>
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<tr>
<td></td>
<td></td>
<td>Comprehensive, will cover Units 1-4</td>
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</tbody>
</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
Each student’s individual career experiences provide valuable perspective to their peers. Therefore, it is critical that you attend class regularly to be a partner in this enhanced learning environment. At each class meeting, attendance will be noted. It is each student’s responsibility to contact the instructor directly (phone or e-mail), in advance, if class will be missed. The instructor will not accept late work without valid reasons. Students with a university approved scheduled absence (athletics, military duty, etc.) must contact the instructor well in advance (>72 hrs) of a scheduled absence. Exams may be taken early in those specific cases. Students who do not arrange to take exams ahead of time will not be eligible for this special consideration. A written excuse from the university department involved is required.

Students are encouraged to contact the instructor anytime they are not achieving their intended level of success, prior to taking any other action. Students who need to withdraw must complete an official form and submit it consistent with college policy no later than the official published date. “Incomplete” grades are awarded only when an emergency prevents a student from completing a minor portion of the course assignments. Active participation is a part of your grade. It includes (1) asking questions; (2) answering questions with supportive evidence; (3) responding to other student’s comments, etc. Students are expected to be on time for class, to address others with respect, and to project an attentive and concerned demeanor.

Late Work and Make-up Exams
All exams count toward your class grade. No exam grade will be dropped. No make-up exams will be given. If an exam is missed with proper prior notification, the test may be taken as soon as possible after the exam date, but no later than the following class day. If the exam is not taken, a grade of zero (0) will be entered.

**Extra Credit**
No extra credit assignments will be given.

**Cell Phone Use**
The use of cell phones and other personal electronic devices (PEDs) are prohibited during class. All cell phones must be turned off during the class period. If you are emergency personnel (i.e., EMT, fire, or police) you may set your device to vibrate. Any student who uses a cell phone to make or answer a call, send and read text messages or e-mails (other than IRSC emergency messages), or any other use of a personal electronic device during class may have that device confiscated and be asked to leave class, which will be considered an absence for that class. No student has the right to disturb the teaching and learning process. Voice recording of lectures is allowed, but no video or photography is allowed during class.

**Laptop Use**
Laptop computers and tablets may be used in the classroom for taking notes, as long as they are not a nuisance to other students. However, laptops shall not be used for items as noted above for cell phones or PEDs.

**Food in Class**
There is NO eating or drinking in the classroom.

**Missed Exam**
If an exam is missed with proper prior notification, the test may be taken as soon as possible after the exam date, but no later than the following class day. If the exam is not taken a grade of zero (0) will be entered.

**Participation**
Four or more absences, with the exception of death in the immediate family, sick child/spouse, military service, or personal sickness may result in a failing grade at the discretion of the instructor. You must contact the instructor by phone message or e-mail before class to let the instructor know of your absence.

**Other**
Cheating is defined as:
- Copying to any extent the work of another student
- Intentionally assisting another student during an examination
- Having access to material related to an examination during an examination
- Possessing or having access to unauthorized copies of an examination
- Departing from any stated examination conditions

*Cheating or other academic dishonesty for exams and assignments will not be tolerated
and will result in a Failing (F) grade for the class and suspension.

Plagiarism: The Merriam-Webster Dictionary defines plagiarism as "To pass off as one’s own words or ideas of another."

Plagiarism involves:
- Submitting another person's work as one's own
- Submitting work from any source that is not properly acknowledged by footnote, bibliography, or reference within a paper
- Submitting work pieced together from phrases and/or sentences from various sources without acknowledgement
- Submitting work with another person's phrase(s) rearranged without acknowledgement
- Submitting work that uses any phrase, sentence, or stylistic mannerism without acknowledgement
- Omitting quotation marks from any directly quoted material
- Failure to use three dots (...) to indicate omission of one or more words
- Any other actions deemed to be plagiarism by the faculty

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior. See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

- Classroom/Professional Behavior
  A professional courteous behavior must be exhibited while in class. Students are in the class to learn and distracting behavior will not be tolerated. There is NO eating or drinking in the classroom.

- Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course by Friday, November 6, 2015. No student is eligible to receive a W without completing the official drop process by this deadline. Visit the Office of the University Registrar for the Course Drop Form that must submitted. After Friday, November 6, a student will not be allowed to drop a course.

- Grade Appeals (College of Science and Engineering)
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, 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 upon 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,
including the responsibilities of the parties involved in the process and the number of
days allowed for completing the steps in the process, see University Procedure
13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible
through the University Rules website at
http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science
and Engineering Grade Appeals webpage at
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, the Office of the College of Science and Engineering Dean, or the
Office of the Provost.

- **Disability Services**
  Disability Services (DS) is the hub for coordinating services and accommodations to
  ensure accessibility and utilization of all programs for all Texas A&M University-
  Corpus Christi students with disabilities. Our services are designed to meet the
  unique educational needs of enrolled students with documented permanent or
temporary disabilities. DS provides intake and consultation services to students
  seeking to register with our office. DS reviews an individual’s documentation of
disability and assesses eligibility for services and the determination of reasonable
accommodations. For more information visit the Disability Services Office at 116
Corpus Christi Hall or go to http://disabilityservices.tamucc.edu/

L. **OTHER INFORMATION**
   **Methods of Achieving Success:** Achieving success in this course will require a time
commitment outside of class that averages three to six hours per week for reading and
studying. Students benefit from actively participating in the lab throughout the semester,
classroom discussion, and activities.

**GENERAL DISCLAIMER**
I reserve the right to modify the information, schedule, assignments, deadlines, and
course policies in this syllabus if and when necessary. I will announce such changes in a
timely manner during regularly scheduled lecture periods.