What’s the roles and relations of microorganisms to the environment? How to apply the knowledge of microbiology to tackle environmental challenges? Through lecturing, reading, team project, and hands-on laboratory training, this course will provide you fundamental knowledge of microbiology and practical applications to environmental concerns.

• Who can attend?
  - Upper-level undergraduate and graduate students

• Topics to be covered:
  - Fundamentals of microbiology (microbial physiology, microbial metabolism and growth, microbial phylogeny, microbial genetics);
  - Environmental microbiology (microorganisms in the environment, microbial ecology, microbial activities and interactions with the environment);
  - Practical application of environmental microbiology (microbiology and environmental quality, biodegradation of environmental pollutant, applications in emerging concerns such as drug resistant microorganisms, climate change mitigation, and production of renewable fuels).

• Hands-on laboratory training in:
  - Molecular biology;
  - Detection of microorganisms and their activities in the environment;
  - Microorganisms mediated biodegradation of environmental pollutants.

• For more information contact:
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Wayne State University  
Department of Civil & Environmental Engineering  

CE 5995/7995, Special Topic: Applied Environmental Microbiology  
Fall 2015

Basic principles and practical applications of microbiology to environmental concern for upper-level undergraduate students and graduate students

Instructor  
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Office Phone: 313-577-9962  
Email: zhangyl@wayne.edu

Lecturing Time and Place  
Monday 5:30-9:10 pm, 0105 Old Main

Office Hours  
Monday 3:00 – 5:00 pm or by appointment

Textbooks  
3. Additional readings will be posted to the course website and announced in class.  
*Textbooks on reserve at the Undergraduate Library.

Prerequisites  
None, but basic biology and biochemistry courses are highly recommended.

Course Description  
This course is designed for upper-level undergraduate and graduate students to provide fundamental knowledge of microbiology, roles and relations of microorganisms to the environment, and practical applications of microbiology to environmental concerns including the application of microbiology in water treatment systems, biodegradation of environmental pollutants, control of drug-resistant organisms, global climate change, production of alternative fuels, and genetically modified microorganisms.

Topics covered include:  
- Fundamental knowledge of microbiology, including morphology, physiology, and genetics of microorganisms;
• Environmental microbiology, including microorganisms in the environment, microbial ecology, and detection of microorganisms and their activities in the environment;

• Practical applications of microbiology to environmental concern, including microbiology and water quality, biodegradation of environmental pollutants, control of drug-resistant microorganisms, production of renewable fuels, global climate change, and genetically modified microorganisms.

Learning Outcomes
1) Learn basic principles of microbiology (morphology, physiology, and genetics);
2) Understand roles and relations of microorganisms to the environment;
3) Learn how to use different methods for the detection and characterization of microorganisms and their activities in the environment;
4) Apply fundamental knowledge of microbiology to solve environmental problems;
5) Develop skills of critical thinking, problem solving, team work, and scientific communication through group projects.

Evaluation
Participation (including lecture and lab): 10%
Homework: 20%
Midterm: 20%
Final: 25%
Group project: 25%

• Participation (10%): Your participation will be assessed on class attendance, class discussion, and your contribution to the group project. In addition to lectures, there will be 2-3 lab sections in this course to help you understand the knowledge you learn from lectures. You are expected to attend all lab sections. Absence of lab sections will significantly affect your participation credit.

• Homework (20%): You will be assigned short homework assignments throughout the semester (roughly once every 2-3 weeks, total 4 homework assignments). Homework solutions will be posed on the class Blackboard two days after the due date.

• Midterm (20%) and final (25%) exams: You will have one midterm exam and one final exam in the course. The exam will be closed books and notes.

• Group project (25%): A group project will be assigned early in the semester such that each group will apply the knowledge of environmental microbiology to investigate one specific topic. Students can select the topic of interest from the list suggested by the instructor or choose their own topic with instructor approval. Near the end of the semester, each group will prepare an oral presentation (10-15 min) to the class and submit a written project report.
## Grading Scales

<table>
<thead>
<tr>
<th>Percent of possible points</th>
<th>Assigned Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
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<tr>
<td>85-89</td>
<td>A-</td>
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<tr>
<td>80-84</td>
<td>B+</td>
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<tr>
<td>75-79</td>
<td>B</td>
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<tr>
<td>70-74</td>
<td>B-</td>
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<tr>
<td>65-69</td>
<td>C+</td>
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<tr>
<td>60-64</td>
<td>C</td>
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<tr>
<td>&lt;60</td>
<td>F</td>
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The instructor may give a higher grade to students. These adjustments will be based on a multitude of factors such as evidence of group leadership in the project, distribution of grades across the class, etc.

Grades may be appealed within 1 week of the date the grading is first returned to students. To appeal a grade, you must submit the original assignment or exam and explain in writing why you believe the grade was inaccurate. Any adjustments to the original grade are at the discretion of the instructor and may or may not be considered.

## Late Assignments

Homework assignments are typically due before the class. Late assignments will be accepted with a maximum of two days late, with a deduction of 10% of the assignment grade for each 24-hours period beyond the deadline. No homework will be accepted more than two days late.

## Disabled Students

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TTD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours or at another agreed upon time to discuss your needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

## Religious Holidays

Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

## Class Recordings

Students need prior written permission from the instructor before recording any portion of this
class. If permission is granted, the audio and/or video recording is to be used only for the student’s personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why he cannot, such as discussion of confidential or protected information.

**Student Services**
- The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit www.success.wayne.edu for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses).
- The Writing Center is located on the 2nd floor of the Undergraduate Library and provides individual tutoring consultations free of charge. Visit http://clasweb.clas.wayne.edu/writing to obtain information on tutors, appointments, and the type of help they can provide.

**Course Drops and Withdrawals**
Course drops and withdrawals information can be found at university website: https://wayne.edu/students/register/dropping/. If a student needs help dropping a class, they should send an email request to registration@wayne.edu with the appropriate course information. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step.

**Academic Dishonesty**
- Plagiarism and Cheating: Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.
- Cheating: Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include: (a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.
- Fabrication: Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.
- Plagiarism: To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.
- Other forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any
attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records.

Pass-Through Charges
Students should expect no additional required charges during this course.

Expectations:

- This course will require some reading and conducting a research project. It assumes you will complete the reading, complete the project that you are passionate about (at best) and interested in (at worst), listen attentively during the lecture portion of the class, and participate actively during the discussion.

- This class will use WSU Blackboard system. Students are expected to obtain information about class and may be required to download or turn in assignments/tests using this system. All course related e-mail will be communicated through blackboard or your WSU email address.
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<thead>
<tr>
<th>Schedule</th>
<th>Date</th>
<th>Topic</th>
<th>Assignments</th>
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<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>Sep 14</td>
<td>Introduction to microbiology: roles and relations of microorganism to the environments, and class admin (<em>no class on Sep 7th</em>)</td>
<td>HW #1a</td>
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<tr>
<td><strong>Fundamentals of</strong></td>
<td>Sep 21</td>
<td>Microbial physiology: cell biochemistry</td>
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<td><strong>Microbiology</strong></td>
<td>Sep 28</td>
<td>Microbial metabolism and growth</td>
<td>HW#1d</td>
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<td>Oct 5</td>
<td>Microbial diversity &amp; phylogeny</td>
<td>HW#2a</td>
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<td>Oct 12</td>
<td>Lecture: Microbial genetics</td>
<td>HW#2d</td>
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<td>Lab section 1: DNA extraction from microorganisms</td>
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<tr>
<td><strong>Midterm Exam</strong></td>
<td>Oct 19</td>
<td>Midterm</td>
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<tr>
<td><strong>Environmental</strong></td>
<td>Oct 26</td>
<td>Microorganisms in the environment</td>
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<tr>
<td><strong>Microbiology</strong></td>
<td>Nov 2</td>
<td>Microbial ecology</td>
<td>HW#3a</td>
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<td>Nov 9</td>
<td>Microbial activities and interactions with the environment</td>
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<td>Lecture: Detection and characterization of microorganisms and their activities</td>
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<td>Lab section 2: e coli test for water quality</td>
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<td><strong>Practical Applications</strong></td>
<td>Nov 16</td>
<td>Microbiology and water quality (microbiology in natural and engineered water systems)</td>
<td>HW#3d HW#4a</td>
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<td>Nov 23</td>
<td>Lecture: Biodegradation of environmental pollutants</td>
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<td>Nov 30</td>
<td>Drug-resistant microorganisms and their control</td>
<td>HW#4d</td>
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<td>Dec 7</td>
<td>Applications in climate change mitigation, production of renewable fuels, and genetically modified microorganisms</td>
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<tr>
<td><strong>Project Presentation and Course Wrap-up</strong></td>
<td>Dec 14</td>
<td>Project presentation and course wrap-up</td>
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<tr>
<td><strong>Final Exam</strong></td>
<td>Dec 21</td>
<td>Final Exam</td>
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