

**GEOL5315**  
**Environmental Microbiology**

**Instructor:** Jie Xu, Ph.D.  
Geological Sciences #319  
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**Meeting Time:** TR 1:30 pm -2:50 pm, Geological Sciences #302

**Office Hours:** By appointment

**Course References:**

1. *Brock Biology of Microorganisms* (15th Edition)
2. *Environmental Microbiology: From Genomes to Biogeochemistry* (2<sup>nd</sup> edition), Madsen

**Course Description:**

Microorganisms, with an amazing history of evolution collectively, have left their footprint everywhere on Earth, in both natural and anthropogenic environments. As such, there is a lot for us to study in the context of environmental microbiology. This course is designed to largely reflect the inherently multidisciplinary nature of environmental microbiology, by covering not only the basic biology of microorganisms in their diverse forms, but the deep connection of the microbial world to their environment. Through the semester, we will go through the following modules: (I) foundations of microbiology: structure, metabolism, molecular information flow; (II) microbial growth and regulation; (III) microbial diversity (various levels) → tied to diverse habitats, (IV) microbial ecology, (V) methods to study environmental microbiology, and (VI) case studies.

**Learning Goals:**

*Knowledge-wise*

- to understand the basic components of microorganisms and identify how these fundamental chemical building blocks are involved in processes required for living microorganisms
- to know the requirements for bacterial and archaeal cellular metabolism, be able to summarize such metabolism using balanced chemical equations, and recall the different metabolic pathways presented during the course
- to differentiate the environmental conditions required to survive, thrive, or even dominate a niche using examples of the specific species discussed in class and apply this understanding to explain unique aspects to the survival of these specific species
- to develop familiarity with methods for studying microbial diversity and functions and be aware of each method's limitation
- to understand through case studies how microorganisms may be used in environmental remediation, resource recovery, and wastewater treatment, etc.

*Skill-wise*

- to develop strong skills in scientific reading and capability of summarizing the information using the lay language
- to strengthen in oral communication/presentation skills
- to become effective in literature search
- to improve critical thinking skills

**Grade Components & Grading Policies:**

The final grade is of four components: participation, a mid-term, a final and an in-class presentation. If your final grade is in the range of > 90% - A; 89-80% - B; 79-70% - C, 69-60% - D; < 60% - F.

	Graduate
Participation/attendance	15%
Midterm	25%
Final exam	35%
In-class presentation	25%
Total	100%

- **Exams:** the midterm is a closed-book and in-class test, while the final is open-book, take-home exam. No make-up exams will be given for reasons other than critical illness (documentation required), official University businesses (instructor's prior approval and documentation required) or extreme emergencies (documentation required).
- **In-class presentation:** on a virtual project that involves the application of environmental microbiology. This may be from literature review or from your research project. Evaluation criteria will be elaborated after mid-term.
- **Honor codes:** academic integrity is the fundament principle for all UTEP students, staff and faculty. Refer to the UTEP Student Handbook where scholastic dishonesty is defined (<http://sa.utep.edu/osccr/academic-integrity/>). Proven violations of these detailed regulations may result in any of the consequences outlined in the Handbook.
- **Plagiarism:** Using another person's ideas, words, drawings, etc. without giving proper credit (i.e. citation) is considered plagiarism. This includes anything from a book, magazine, technical report or journal, or website. It ALSO includes anything copied from another student's paper or from a paper you wrote for another class. Plagiarism is considered *Academic Dishonesty* and you may be reported to the Dean of Students if suspected of plagiarism.

**Drop Date:**

The College of Science aligns with UTEP's posted drop date of March 27 for the Spring 2020 semester. We will not approve any student- or faculty-initiated drop requests for a course after that date, except under circumstances of complete withdrawal of all courses due to medical or non-medical reasons.

**Students with Disabilities:**

If you have a disability and may need accommodations in this class, you are encouraged to contact the Center for Accommodations and Support Services (CASS) at 915-747-5148 or [cass@utep.edu](mailto:cass@utep.edu) within the first two weeks of class. Here is the link to the resources available to students with disabilities <http://admin.utep.edu/Default.aspx?tabid=61021&submenuheader=2>.

<i>Week</i>	<i>Date</i>	<i>Topics</i>	<i>Textbook Reading</i>
1	Jan 21 Jan 23	Introduction Cell structure and functions	Ch 2 (B)
2	Jan 28 Jan 30	Metabolism (I) Metabolism (II)	Ch 3 (B)
3	Feb 4 Feb 6	Molecular information organization Growth and environmental controls	Ch 4 (B) Ch 5 (B)
4	Feb 11 Feb 13	Regulatory system Genomics and genetics	Ch 6 (B) Ch 9 & 11 (B)
5	Feb 18 Feb 20	Evolution and systematics Mid-term I	Ch 13 (B)
6	Feb 25 Feb 27	Metabolic diversity (I) Metabolic diversity (II)	Ch 14 (B)
7	Mar 3 Mar 5	Functional diversity (I) Functional diversity (II)	Ch 15 (B)
8	Mar 10 Mar 12	Physiological ecology Nutrient Cycle	Ch 3 (En) Ch 20 (B)
9	Mar 17 Mar 19	<i>Spring break – No class</i>	
10	Mar 24 Mar 26	<i>No class (ACS invited talk)</i> Microbial ecosystem – Soil	Ch 4 (En) Ch 19 (B)
11	Mar 31 Apr 2	Microbial ecosystem – aquatic Microbial ecosystem - subsurface	Ch 4 (En) Ch 19 (B)
12	Apr 7 Apr 9	Extremophiles Microbiology of the built environment (I)	Ch 22(B)
13	Apr 14 Apr 16	Microbiology of the built environment (II) Microscopy and cultural techniques	Ch 22 (B)
14	Apr 21 Apr 23	Physiological methods Nucleic acid based (i.e., PCR)	
15	Apr 28 Apr 30	A virtual lab on PCR primer design Overview of environmental “omics”	
16	May 5 May 7	Class presentations & Final exam handout	
16	May 11 May 15	<i>Final Exam Week</i>	

*The actual schedule is subject to modifications.*