

MICROBIOLOGY FOR SCIENCE MAJORS – BIOL 2321

Instructor: Dr Crystal Kelehear Graham, Assistant Professor
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Office Hours: Virtual (by appointment)

Lecture: Online. Twice Weekly. Pre-recorded lectures posted to Blackboard on Tuesday and Thursday.

Recommended Text for Lecture: Madigan et al. 2017. Brock Biology of Microorganisms. 15th Edition. Pearson.

Course description:

This course will focus on microorganisms and how they impact our everyday lives. As an introductory course in Microbiology, the focus will be on the ubiquity, diversity and evolution of microorganisms, microbial ecology, and medical microbiology. Genetics, genomics and molecular biology will receive less attention as these topics are covered in other courses.

Marketable Skills (MS):

The biology student graduating with a BS in Biology should have the following MS:

- 1) *Ability to organize, analyze, and interpret data.
- 2) Proficiency in using presentation software.
- 3) *Experience in managing time and meeting deadlines.
- 4) *Ability to speak effectively and write concisely about scientific topics.
- 5) *Experience in the development of professional email correspondence.

*MS specifically addressed by this course

Student Learning Outcomes (SLO):

The biology student graduating with a BS in Biology should be able to:

*SLO1** demonstrate an understanding of basic biological concepts, including but not limited to evolution via natural selection, cell theory, and the role and function of DNA.
SLO2 demonstrate utilization of various field techniques toward addressing scientific questions in the specific discipline. These field techniques can include, but are not limited to, plant collection and processing, various animal collection techniques, ecological surveying and sampling, and biodiversity indexing.
SLO3 use biological instrumentation to solve biological problems using standard observational strategies.
*SLO4** develop writing skills by summarizing and critiquing recent relevant biological literature.

*SLO specifically addressed by this course

Student Learning Objectives for this Course:

- 1) Students will outline the differences between prokaryotes and eukaryotes
- 2) Students will demonstrate an understanding of microbial growth, nutrition and metabolism
- 3) Students will demonstrate an understanding of microbial ecology and nutrient cycling
- 4) Students will outline the basic features of bacteria, archaea, fungi, algae, protists and viruses
- 5) Students will demonstrate an understanding of diseases caused by bacteria, fungi and viruses

Academic dishonesty and late or missed work: All assessments should be your own work, unless it is a pair/group assignment. Any evidence that the work is copied from a peer or the internet or any other source will result in a zero for the assessment and you will be reported to the university for Academic Dishonesty. I do not accept late work. **Students cannot miss any exams or assessments** unless they have a documented, university-approved excuse; in these cases, the instructor needs to be informed in writing **at least 24 hours in advance** of the exam or assessment due date. Assignments and quizzes will be posted for long enough that an absence or technological difficulty on the due date generally does not constitute grounds for an extension. University-approved absences include SRSU athletic events, death in the family, illness, etc (see <https://www.sulross.edu/sites/default/files//sites/default/files/users/docs/stulife/academic.pdf> for further details). **The make-up exam must be taken within 6 days of the original exam.**

Studying: As a general rule, students should spend 2-3 hours studying for every 1 hour of lecture material. So, for this class, you need to allocate 5-7.5 hours per week to study the lecture material. I recommend reading your notes in conjunction with reading the relevant textbook chapters. Studying is best done shortly after the lecture, not all at once the night before the exam. Look up anything that you do not understand or reach out to your instructor to set up a meeting.

Grading: There will be three lecture exams, each of equal contribution to the student grade. Exams will cover the lecture material immediately preceding the exams *i.e.*, there will be no comprehensive final exam.

	Weighting	Points
Exam I	25%	125
Exam II	25%	125
Exam III	25%	125
Assignments	25%	125
TOTAL	100%	

Grades: A 90 – 100% B 80 – 89% C 70 – 79% D 60 – 69% F 0 – 59%

Class schedule (subject to change):

Date		Topic	Textbook Chapter
12 Jan	Lecture 1	An Introduction to the Course + Microorganisms	1
14 Jan	Lecture 2	History of Microbiology	1
19 Jan	Lecture 3	Microbial Cell Structure	2
21 Jan	Lecture 4	Microbial Cell Structure & Function (continued)	2
26 Jan	Lecture 5	Microbial Cell Structure & Function (continued)	2
28 Jan	Lecture 6	Microbial Metabolism & Molecular Microbiology	3-4
2 Feb	Lecture 7	Microbial Growth & Control	5
4 Feb	Lecture 8	Microbial Growth & Control	5
9 Feb	Lecture 9	Viruses	8
11 Feb	EXAM	EXAM I	
16 Feb	Lecture 10	Microbial Evolution	12
18 Feb	Lecture 11	Diversity of Bacteria	15
23 Feb	Lecture 12	Diversity of Bacteria (continued)	15
25 Feb	Lecture 13	Diversity of Bacteria (continued)	15
2 Mar	Lecture 14	Diversity of Archaea	16
4 Mar	Lecture 15	Diversity of Archaea (continued)	16
16 Mar	Lecture 16	Diversity of Eukaryotic Microorganisms	17
18 Mar	Lecture 17	Diversity of Eukaryotic Microorganisms (continued)	17
23 Mar	Lecture 18	Diversity of Eukaryotic Microorganisms (continued)	17
25 Mar	EXAM	EXAM II	
30 Mar	Lecture 19	Microbial Ecology	19-20
1 Apr	Lecture 20	Microbial Symbioses	22
6 Apr	Lecture 21	Microbial Symbioses	22
8 Apr	Lecture 22	Microbial Interactions with Humans	23
13 Apr	Lecture 23	Microbial Interactions with Humans (continued)	23
15 Apr	Lecture 24	Diagnostic Microbiology & Vaccines	27
20 Apr	Lecture 25	Bacterial and Viral Diseases	29-31
22 Apr	Lecture 26	Bacterial and Viral Diseases (continued)	29-31
27 Apr	Lecture 27	Bacterial and Viral Diseases (continued)	29-31
5 May	EXAM	Wednesday May 5: EXAM III (10:15-12:15pm)	

Note – Lecture topics are subject to change according to course interest, organization, and timing constraints, however the exam dates will remain the same.

Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, Suite 112, Ferguson Hall, Ph: 432-837-8203, email rebecca.wren@sulross.edu

Core Objectives Addressed:

- Team Work*
- Communication*
- Critical Thinking Skills
- Empirical and Quantitative Skills

*Addressed in Spring 2021

Assessment of Core Objectives:

1. Communication

1.1. Written communication will be assessed through written assignments. Specifically, students will critically analyze scientific papers and then write up reaction pieces. The written responses will be assessed for quality of composition, accuracy of content, analysis, interpretation, and synthesis of data, and evaluation of the topic as a whole. Grades will be assigned using a standardized rubric and compared between the beginning vs end of term.

2. Team Work

2.1. Team work will be assessed through take-home group assignments administered at the beginning and the end of the semester. Team members will be randomly assigned to a group by the instructor, and each group will have to turn in a group assignment for a group grade. In addition to the instructor-assigned group grade, there will be a peer grade, assigned to each member of the group by their team members. The peer grade will be assigned according to each team member's perceived contribution to the group assignment. The inclusion of the peer grade will allow greater insight into how each individual performs within a team. The instructor assigned group grade will be added to the peer group grade for the final grade for the task. This task will be repeated late in the semester, and the group and peer grades will be compared between the beginning vs end of term. Both the instructor and the students will use standardized rubrics to assign grades.

3. Critical Thinking

3.1. Critical thinking skills will be assessed through written assignments. Specifically, students will critically analyze scientific papers and then write up reaction pieces. The written responses will be assessed for quality of composition, accuracy of content, analysis, interpretation, and synthesis of data, and evaluation of the topic as a whole. Grades will be assigned using a standardized rubric and compared between the beginning vs end of term.

4. Empirical and Quantitative Skills

4.1. Exams will contain data-based questions to assess the understanding of key concepts such as bacterial growth curves, bacterial virulence (LD_{50}), minimum inhibitory concentrations of antibiotics, and antibody titers. Questions of this nature will be included on the first and last exam of the semester and grades will be compared between the two time periods. In addition, students will critically analyze scientific papers and write up reaction pieces. This will involve analysis, interpretation and synthesis of data. Grades will be assigned using a standardized rubric and compared between the beginning vs end of term. These skills will be further developed and assessed with practical experiments conducted in the sister lab BIOL2121 where students will collect data, analyze it, and draw conclusions on their results.