Revised 1/2024

General Microbiology BISC 300L

13017
Units: 4
Spring 2024
Lecture: T/Th — 12:30-1:50 pm
Location: ZHS 163

Labs
13272 W — 9:00-11:50 am
13273 W — 1:00-3:50 pm
13275 Th — 9:00-11:50 am
Location: ZHS 472

Instructor: Julia Schwartzman, Ph.D., Assistant Professor
Office: AHF 334
Office Hours: By appointment
Contact Info: julias21@usc.edu (Will respond to emails within 24 hours Monday-Friday, and on the Monday following a weekend or holiday break)

Instructor: Cameron Thrash, Ph.D., Associate Professor
Office: AHF 209
Office Hours: By appointment
Contact Info: thrash@usc.edu (Will respond to emails within 24 hours Monday-Friday, and on the Monday following a weekend or holiday break)

Lab Manager: Celeste Chong-Cerrillo, Ph.D.
Office: ZHS 450 or Zoom
Office Hours: Open door policy or by appointment
Contact Info: chongcer@usc.edu (Subject line should state "BISC 300")

Lab Instructors: Hasti Asrari, Eesha Rangani, Yiming Zhao
Office Hours: TBD
Office Hour Location: TBD
Contact Info: asrari@usc.edu, rangani@usc.edu, zhaoyimi@usc.edu

Course Description
This course will explore the world of microorganisms via a comparative approach to Bacteria, Archaea, Protists, and Viruses: their structure, life cycles, geochemical activity, ecology, and nutrition. Fundamentals of metabolism and microbial genetics will also be explored alongside evolution and systematics.

General Course Aspirations
Through lectures, laboratories, and projects you will gain experience toward some of the general curricular goals of the University as related to Microbiology:

(1) the ability to think logically, analytically, and independently;
(2) the ability to communicate clearly and effectively, both orally and in writing;
(3) the ability to learn on one's own and as part of a group; and
(4) general broad knowledge of the sub-discipline of microbiology

Learning Objectives

Learning Objective **By the end of this course, students should be able to:**	**Assignment/Assessment** **This learning objective skill is measured by:**
1. Describe the features of cells from different domains of life	Labs, problem sets, classroom activities
2. Explain different strategies for how cells replicate and make energy	Labs, problem sets, classroom activities
3. Contrast different approaches to characterize and measure microbial diversity	Problem sets, classroom activities
4. Apply bioinformatic approaches to study microbial diversity	Problem sets, final project
5. Evaluate and summarize primary scientific literature in microbiology	Problem sets, final project, classroom activities
6. Communicate current research in microbiology to a general audience	Final project
7. Apply knowledge of microbes, and their internal processes to understanding of biology at the scale of a symbiosis and an ecosystem	Classroom activities, problem sets
8. Explain how microbes shape human health and disease	Labs, Classroom activities, problem sets

Prerequisite(s): 1 from (BISC 103 or BISC 120 or BISC 121 or BISC 220 or BISC 221) and 1 from (BISC 312 or BISC 320)
Co-Requisite(s): None.
Concurrent Enrollment: None.
Recommended Preparation: working knowledge of principles in molecular biology and biochemistry

Course Notes

We expect the course to take students roughly 11 hours per week, including lectures (~3 hrs), lab (~3 hrs), and assignments (remaining time). **See below for assignment descriptions.** Lectures will involve classroom participation as we cover pertinent topics in microbiology and are intended to be attended in person. We do not plan to record lectures unless this is part of a reasonable accommodation. Laboratory sections will involve hands-on training in a variety of techniques and experiments meant to compliment material in the lectures, although they may not be perfectly synchronized due to time considerations. The course will be using Blackboard for course management. Slides will be posted after the lectures.

Communication

Communication and collaboration are essential for scientists, especially when evaluating primary literature and working on research projects, like you will be doing in this course. Therefore, we want you to feel comfortable asking questions and giving us feedback on this course just as we will be providing you with feedback on your assignments. If you have questions or comments, please speak to us directly after class or make an appointment for office hours (emails above). Instructors Schwartzman and Thrash will respond to emails within 24 hours Monday-Friday, and on the Monday following a weekend or holiday break.

Postings on Blackboard will be an official source for announcements, course materials, lecture slides, grade postings, and general discussions. Blackboard lists BISC 300 lecture and lab sections as separate courses. You are responsible for checking both Blackboard sites on a regular basis, and grades for each part of the class (lab and lecture) will be posted on these separate sites. If you notice a problem with your grade, please notify the corresponding instructor as soon as you can.

Technological Proficiency and Hardware/Software Required

You will need access to a computer with a broadband internet connection to interact with Blackboard and Wikipedia for the final project. All other technological proficiency will be taught as part of the course, and the software required will be accessed online.

Required Readings and Supplementary Materials

Textbook: Madigan, Martinko, Bender, Buckley, Stahl, *Brock Biology of Microorganisms*, 16th Edition
Laboratory Manual: Introduction to Microbiology Laboratory Manual, Spring 2024 (USC Bookstore)

Website: Blackboard (course associated materials and grades)

Description and Assessment of Assignments

Problem sets There are no exams in the lecture part of this course. Instead, you will be assigned weekly problem sets designed to reinforce the material we cover in lecture. The p-set format allows us to ask you questions that might require you to do a bit of extra reading and research to answer, or that ask you to apply or evaluate concepts we learn in class. We expect you to complete p-sets independently (see policy on group work).

Final project Over the course of the semester, we'll be asking you to build a Wikipedia page for a microbe or microbial process not already represented on Wikipedia, or one in need of editing. As the semester progresses, you'll learn to create and edit a wikipedia page. During our final exam spot you'll give a short presentation to share what you've created with the class. Pages will be published at the end of the semester.

Lab reports throughout the semester you will prepare four lab reports. Three will be focused on data collection and analysis, and the fourth will be a formal lab report. Please refer to the lab manual for a more detailed description of these assignments.

Lab exams will test your understanding and application of the topics and exercises covered in the laboratory sessions. Lab exams will be at the beginning of the lab session. The lab manual contains a more detailed description of this assessment.

Participation

There will be in-class activities that will require your participation. Missing these activities may affect your grade.

Grading Breakdown

Grades will be recorded in the Blackboard gradebook and updated regularly.

Assessment Tool (assignments)	Points	% of Grade
Problem sets (15, 20 points each)	300	46
Final Project	150	23
Laboratory*	200	31
TOTAL	**650**	100

*For more detail about the components of the lab grade, refer to the lab manual.

Assignment Submission Policy

Assignments, Final Project deliverables, and Lab deliverables will be either submitted in person, submitted to Blackboard, or submitted through email, as communicated by the instructors.

Grading Timeline

We expect to have all grades completed within two (didactic) to four (laboratory) weeks of the deliverable due date.

Course Specific Policies

Late assignments will be penalized 20% of a grade per day. Any document associated with grading may be photocopied by the instructional staff. If you feel that an error was made in the grading of a problem set, you need to do the following: 1) Prepare a printed statement explaining why you feel your grade was incorrect, and 2) submit this and your original problem set to your instructor within one week of the time the examination was returned to you. Your entire problem set may be re-graded and, as a result, your grade may increase or decrease from a requested re-grade.

Attendance

The course is meant to be attended in person, and non-attendance can be the basis for lowering your grade. Student athletes with approved Travel Request Letters and students who give advance notice of religious observation will have exemptions. These students will be responsible for organizing make-up work and due dates with the instructor in advance. Absences for illness will also be granted, please notify the instructor about the class you will miss, and organize accommodations and make-up work at this time. Those with approved absences will have the option of attending the course remotely.

Classroom norms

Discussing the results and interpretation of scientific research is a key part of the scientific process because evaluation of research quality is how scientists determine the degree to which they can trust the results of a given study. Furthermore, debate about the meaning of findings is an important element in contextualizing research impact and determining where new research effort should be applied. In this course, we will be discussing scientific research in the primary literature every week, so it is important that these discussions occur in a professional scientific manner. Therefore, we agree to the following in class:

- Treat everyone with respect and dignity.
- Criticize ideas, not individuals.
- Always be mindful of the following: would you say it to the individual in person?
- Be courteous and refrain from interrupting others.
- Don't dominate conversations- ensure everyone has a chance to contribute.
- Ask questions, especially when you don't understand something.
- Support your statements with evidence and explain your rationale.

Zoom etiquette

- Mute your microphone if you are not speaking.
- Chat will only be used to make comments to the entire class (private chat will be disabled).
- Please use the "raise hand" function in Zoom to request clarification or ask questions. This will reduce interruptions.
- Please use your video whenever possible and participate actively if you are attending the live sessions.
- If you have technical issues, please email the instructor (thrash@usc.edu, julias21@usc.edu).

Course Schedule- Lectures

Subject to change. Please check Blackboard regularly for assignments including additional assigned readings and any changes. PS – problem set; these will be due by the end of Friday each week they are assigned, as noted on Blackboard.

Day	Wk	Module	Topic	Instructor	Assignments
01/09	1	Phys	Intro/course overview	Thrash	
01/11		Phys	From molecules to cells (constraints of being a single cell)	Thrash	PS 1
01/16	2	Phys	Sticking, swimming, navigating	Schwartzman	
01/18		Phys	The physiology of microbial growth	Schwartzman	PS 2
01/23	3	Phys	The central dogma for prokaryotes	Schwartzman	
01/25		Phys	Metabolic regulation	Schwartzman	PS 3
01/30	4	Phys	Redox/energetics I	Thrash	
02/01		Phys	Redox/energetics II	Thrash	PS 4
02/06	5	Syst/Genom	The tree of life/microbial systematics I	Thrash	
02/08		Syst/Genom	Reconstructing microbial genomes	Thrash	PS 5
02/13	6	Syst/Genom	The tree of life/microbial systematics II- genomes and eukaryotes	Thrash	
02/15		Syst/Genom	Comparative genomics	Thrash	PS 6
02/20	7	Syst/Genom	Horizontal gene transfer changes everything	Schwartzman	

02/22		Syst/Genom	Microbial population biology	Schwartzman	PS 7
02/27	8	Syst/Genom	Microbial eukaryotes	Schwartzman	
02/29		Syst/Genom	Viruses	Schwartzman	PS 8
03/05	9	Eco	Microbial diversity from an ecological perspective	Thrash	
03/07		Eco	Measuring diversity I	Thrash	PS 9
03/12	10		**Spring Recess**		
03/14					
03/19	11	Eco	Measuring diversity II	Thrash	
03/21		Eco	Ecology with omics	Thrash	PS 10
03/26	12	Eco	Nutrient cycling I	Thrash	
03/28		Eco	Nutrient cycling II	Thrash	PS 11
04/02	13	Eco	Bioremediation/WWT	Thrash	
04/04		Host-mic	Ecology and evolution of symbiosis	Schwartzman	PS 12
04/09	14	Host-mic	Food microbiology	Schwartzman	
04/11		Host-mic	Disease transmission and epidemics	Schwartzman	PS 13
04/16	15	Host-mic	Infectious diseases I	Schwartzman	
04/18		Host-mic	Infectious diseases II	Schwartzman	PS 14
04/23	16	Host-mic	Human microbiome I	Schwartzman	
04/25		Host-mic	Human microbiome II	Schwartzman	PS 15
05/08			Final Presentations 2-4pm		

Course Schedule- Labs

Subject to change. Please check Blackboard regularly for assignments and any changes.

Unit	Day	Wk	Chap	Laboratory	Lab Events
I	**01/10 -11**	1	1	Lab Orientation (Mandatory) Lab Fundamentals in Microbiology	
	01/17 -18	2	2 3 4	Spontaneous Generation of Microbes Microorganisms from the Environment and Manipulation of Cultures Winogradsky Column	
II	**01/24 -25**	3	3 5 6 7	Microorganisms from the Environment and Manipulation of Cultures (cont'd) Microscopy Determination of Bacterial Motility Preparation of Smears and the Gram Stain	
	01/31 -2/01	4	7 8 9	Analysis of Gram stains (if necessary) Endospore Stain Acid-Fast Stain	Chapter 3 Lab Report Due
	02/07 -08	5	10 11	Protists Mycology- Introduction to Filamentous Fungi	
	02/14 -15	6	12 13	Nutrition and Growth of Bacteria Anaerobic Culture Techniques	
	02/21 -22	7	12 13 14 15 16	Nutrition and Growth of Bacteria (cont'd) Anaerobic Culture Techniques (cont'd) Metabolic Activity of (Some) of Microorganisms Oxidase Test Differentiation and Identification of Enterics- IMViC Test	Lab Midterm Exam
		8	14	Metabolic Activity of (Some) of Microorganisms (cont'd)	

	02/28 -29		16 17 18	Differentiation and Identification of Enterics- IMViC Test (cont'd) Coliform Analysis Differentiation and Identification of Unknown *Staphylococcal* and *Streptococcal* Pathogens	
	03/06 -07	9	14 17 18 19 20	Metabolic Activity of (Some) of Microorganisms (cont'd) Coliform Analysis (cont'd) Differentiation and Identification of Unknown *Staphylococcal* and *Streptococcal* Pathogens (cont'd) Wine Production Bacterial Transformation	Chapter 12 Formal Lab Report Due
	03/13	10		**Spring Recess**	
	03/20 -21	11	20 21	Bacterial Transformation (cont'd) Ames Test for Detection of Chemical Carcinogenicity	ID of Staph and Strep Due
	03/27 -28	12	21 22 23 24	Ames Test for Detection of Chemical Carcinogenicity (cont'd) Antimicrobial Testing. The Kirby-Bauer Method Effects of Commercially Available Disinfectants and Antiseptics Lethal Effects of Ultraviolet Light	Chapter 20 Lab Report Due
	04/03 -04	13	22 23 24 25	Antimicrobial Testing. The Kirby-Bauer Method (cont'd) Effects of Commercially Available Disinfectants and Antiseptics (cont'd) Lethal Effects of Ultraviolet Light (cont'd) The Cultivation and Enumeration of Bacterial Viruses	
	04/10 -11	14	25 26	The Cultivation and Enumeration of Bacterial Viruses (cont'd) ELISA	Lab Final Review / Q&A
	04/17 -28	15	26	ELISA (cont'd)	
	04/24 -25	16		Lab Final Exam (cumulative)	Winogradsky Lab Report Due

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. (Living our Unifying Values: The USC Student Handbook, page 13).

Course Evaluations

Student feedback is essential to optimizing this course. You will have an opportunity to submit comments via the standard USC course evaluation survey at the end of the semester.

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Policy for the use of AI Generators. Since creating, analytical, and critical thinking skills are part of the learning outcomes of this course, all assignments should be prepared by the student working individually or in groups. Students may not have another person or entity complete any substantive portion of the assignment. Developing strong competencies in these areas will prepare you for a competitive workplace. Therefore, using AI-generated tools is prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

Collaboration. In this class, you are expected to submit work that demonstrates your individual mastery of the course concepts.

Group work. Unless specifically designated as a 'group project,' all assignments are expected to be completed individually.

Consequences. If found responsible for an academic violation, students may be assigned university outcomes, such as suspension or expulsion from the university, and grade penalties, such as an "F" grade on the assignment, exam, and/or in the course.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.