

Syllabus: BIOS 4744 Microbial Symbiosis and Microbiomes (3 credit hours)

The Georgia Institute of Technology



Instructor:

Dr. Lauren Speare

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Course Information:

Class times: Monday, Wednesday 9:30am - 10:45am

Room: Molecular Sciences & Engineering 1224

Office Hours: by appointment

Target Audience

This course is intended for upper-level science majors and graduate students interested in biology, microbiology, ecology, and how the interactions of these disciplines can be used to understand the important ecological and human health impacts of microbial symbiosis.

Course Description

This course covers host-microbe and microbe-microbe interactions found in marine, terrestrial, and human-associated ecosystems, including both beneficial and parasitic relationships among viruses, microbes, and animals. The goal of this course is to provide students with an understanding of how these diverse and sometimes surprising symbioses have important ecological and human health impacts. The class will begin with a brief introduction to microorganisms and symbiosis before focusing on specific symbiotic interactions and the experimental methods used to discover and characterize them.

Course Organization

BIOS 4744 will meet twice a week, with the first class of the week consisting of lectures and active-learning exercises to introduce the topic for the week and provide students with the background knowledge necessary to understand the content and context of the assigned reading. The second class of the week will be a discussion focused on the reading assignment and a corresponding one- or two-page short-answer problem set (11 problem sets total for the semester). Specifically, discussions will identify the question the researchers set out to answer, their approach, data interpretation, conclusions, and future questions.

Overview of class schedule and topics (subject to change*)

Class #	Date	Day	Topic	Assignment
1	Aug 19	Mon	An introduction to microbes Virtual Lecture	
2	Aug 21	Wed	Defining “symbiosis” & anatomy of primary literature Virtual Lecture	
3	Aug 26	Mon	Discussion of assigned reading	Reading & assignment #1
4	Aug 28	Wed	Lecture: Model systems in symbiosis research	
	Sep 2	Mon	No Class: Holiday	
5	Sep 4	Wed	Discussion of assigned reading	Reading & assignment #2
6	Sep 9	Mon	Guest Lecture: Dr. Kayla Stoy on Mutualism	
7	Sep 11	Wed	Discussion of assigned reading (led by Dr. Kayla Stoy)	Reading & assignment #3
8	Sep 16	Mon	Lecture: Parasitism	
9	Sep 18	Wed	Discussion of assigned reading	Reading & assignment #4
10	Sep 23	Mon	Lecture: Endosymbiosis, organelles, the origin of Eukaryotes	
11	Sep 25	Wed	Discussion of assigned reading	Reading & assignment #5
12	Sep 30	Mon	Lecture: Symbiont genome structure and evolution	
13	Oct 2	Wed	Discussion of assigned reading	Reading & assignment #6
	Oct 7	Mon	Midterm 1	
14	Oct 9	Wed	Lecture: Genotypic and phenotypic diversity	
	Oct 14	Mon	No Class: Fall Break	
15	Oct 16	Wed	Guest Lecture: Dr. Abigail Lind on Animal gut microbiomes	
16	Oct 21	Mon	Lecture: Physical structuring of microbe-host associations	
17	Oct 23	Wed	Discussion of assigned reading	Reading & assignment #7
18	Oct 28	Mon	Lecture: Frenemies-symbiont-pathogen parallels	
19	Oct 30	Wed	Discussion of assigned reading	Reading & assignment #8
20	Nov 4	Mon	Lecture: Microbial evolution and transition	
21	Nov 6	Wed	Discussion of assigned reading	Reading & assignment #9
22	Nov 11	Mon	Lecture: Microbial defense systems	
23	Nov 13	Wed	Discussion of assigned reading	Reading & assignment #10
24	Nov 18	Mon	Lecture: Microbiomes and host development	
25	Nov 20	Wed	Discussion of assigned reading	Reading & assignment #11
	Nov 25	Mon	Midterm 2	
	Nov 27	Wed	No Class: Holiday	
26	Dec 2	Mon	In-class review	
	TBD		Final Exam	

*The professor reserves the right to make changes to the syllabus, including project due dates and test dates (excluding the officially scheduled final examination), when unforeseen circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.

Course goals and learning objectives

Upon completion of this course, students should have developed the following:

- Experimental approaches used to discover and characterize microbial interactions
- How basic scientific discoveries can be applied to generating new research tools
- Improved critical thinking and communication skills
- How to identify unanswered questions in biology and design an experimental approach to answer those questions
- The ecological and human health impacts of symbiotic relationships

Course Materials

This class does not have a textbook. Course material will include topics covered in lectures and assigned readings that will be used for group discussions. A detailed list of assigned readings for the course will be distributed at the start of the class.

Course Policies

Attendance: Students are expected to attend all classes and arrive to class on time. Students must be present in class to receive participation points, which is a large portion of the final grade, therefore attendance is important for successful completion of this class.

Participation: Consists of attendance and participation in weekly discussions. There are 11 discussion days for which you can earn 5 points each toward the total of 50 pts for participation. This means you can miss one discussion without it affecting your final grade. No make-up participation will be offered unless the student has a doctor's note or will miss class for a university-sanctioned event.

Assignments: Readings will be accompanied with one or two assignments consisting of short-answer questions to help guide the students through the primary literature. Students will turn in the completed problem sets **at the beginning of class**. *A late assignment turned in within 24 hr after the original due date/time will be considered for half credit.* There are 11 assignments (5 pts each) and the lowest score will be dropped from the final grade. If a student is absent, the assignment can be turned in electronically, but no make-ups assignments will be offered.

Exams: There will be two midterm exams during the semester and a cumulative final.

Special Circumstances:

Please talk to me directly if you think you will be missing any classes, or if you are registered with Accessibility Resources and Services and have a disability that requires accommodation.

Contesting a grade: A student has until one week after a grade is posted to contest the grade. After a week, grade changes will not be made.

Grading

Midterm 1.....25% = 125 pts
Midterm 2.....25% = 125 pts
Final.....30% = 150 pts
Participation.....10% = 50 pts
Assignments.....10% = 50 pts

Letter Grades

90 to 100 = A (450-500 pts)
80 to 89.9 = B (400-449 pts)
70 to 79.9 = C (350-399 pts)
50 to 69.9 = D (250-349 pts)
<50 = F (<250 pts)

Special Circumstances:

Please talk to me directly if you think you will be missing any classes, or if you are registered with Accessibility Resources and Services (ARS) and have a disability that requires accommodation.

Honor code

It is the student's responsibility to act in a manner that supports the principles of academic integrity outlined in the Georgia Tech honor code, which can be found at: <https://policylibrary.gatech.edu/student-life/academic-honor-code>.

If at any time you are unclear about how the honor code pertains to this course, please come talk to me directly.

I have read and understand the content of the syllabus for BIOS 4744

Name _____

Signature _____ Date _____