

# MIP432 Microbial Ecology Spring 2020

Time: **MWF 12:00-12:50 AM**

Location: **Eddy 103**

Instructor:

**Dr. Ed Hall:** Office: A246 NESB

PH: (970) 491-2162

Office Hours: by appointment

Email: [ed.hall@colostate.edu](mailto:ed.hall@colostate.edu)

## Course Materials and Textbook:

General course materials:

The lecture, homework and exam schedule, and all additional course materials including assigned readings will be available on the course website on Canvas. The lecture schedule and assigned readings are subject to change. Please be sure to check the online schedule regularly.

Course textbook:

The David L. Kirchman text “Processes in Microbial Ecology” (ISBN: 9780199586929) will be the primary text for the course. The text is available from amazon starting at ~\$50. It is also available on the course website for free. Supplementary materials will be made available on the Canvas site.

## Course Description and Objectives:

We will cover the topics of microbial diversity and the interactions of microbial life on the planet earth. There will be an opportunity to tailor portions of the course to your area of specific interest with the course project and to pursue areas of interest to you with more depth and guidance from the instructor and classmates.

This course is centered on the study of active microbes that occur within natural or engineered microbial assemblages. The study of active microbes can be carried out at different levels of resolution. Approaches to study these organisms range from observational, molecular, chemical, enzymatic, and beyond. Beginning with the individual organism, we will consider the biological, physical and energetic structure that surrounds microbes, including physical and biotic interactions that occur in complex natural microbial assemblages. We will use a series of case studies to address some of the challenges of studying these interacting multitudes, in an active state as they exist in complex environments. Recitations, are scheduled for one course period per week, and will provide an opportunity for students to further dissect the contemporary microbial peer-reviewed literature.

After completion of this course, the student will have developed a broad background in microbial ecology that will lead to an improved understanding of the functioning of microbes in our world. Microbes are the foundations for the entire biological world. In this framework, this course will make it possible for students to more effectively integrate concepts of microbial ecology into their view of nature.

## Instruction

Lecture slides will be made available before lecture when possible or shortly thereafter when not. There will be a range of materials presented for reading before class, including chapters from the textbook as well as additional readings, that will form the basis of discussions. All assigned readings should be

completed **before** the class period they are assigned for. One goal is to have active student involvement and discussions as a part of each class meeting. Friday recitations will be student-led discussions of the primary literature and will involve extensive class participation. The instructors will attempt to direct discussion and provide context and feedback

## Evaluation

Please refer to the class schedule. Hourly exams are tentatively scheduled for:

Exam	Class period:	Date Due
Mid-term exam	TBD	March 11 <sup>th</sup>
Final exam	Take home	May 11 <sup>th</sup>

Point breakdown for the course:

Participation in recitation	10 points
Recitation presentation(s)	10 points
Assignment	10 points
Final Project (Write-up and Presentation)	20 points
Mid-term Exam	25 points
Final Exam	25 points

**NOTE:** Corrections on mid-term exams will be possible for one week after return of exams. The right to regrade the entire examination is reserved. All students must take the final exam.

Course grades will be based on the following scale:

A+	≥98%	B+	≥88%	C	≥70%
A	≥92%	B	≥82%	D	≥60%
A-	≥90%	B-	≥80%	F	<60%

## Special needs statement:

Students with disabilities can contact the Resources for Disabled Students at 1-6385 to arrange for accommodations and support services if that is desired. PLEASE NOTE: DAK recommends, if possible, that students needing extra time/a separate quiet room contact DAK ahead of the exam so that a room can be reserved that is close to the examination room.

*Academic integrity:* You are responsible for adhering to all university policies on academic integrity (<http://learning.colostate.edu/integrity/index.cfm>) and student conduct (<http://www.conflictresolution.colostate.edu/conduct-code#conduct>). **Please pay special attention to the university policy on plagiarism.**

## Instructor policies:

Students who miss an exam or an assignment must have documentation to why that was missed. We will do everything we can to accommodate you but the instructor reserves the right to address absences and missed work as I see best.

date	meet	2020 Lecture	Assigned Reading
	1a	MLK day	
22-Jan	1b	intro/overview to microbial ecology (epistemological framework)	
24-Jan	1c	Discussion of Final Project and How to Lead a Discussion	
27-Jan	2a	Overview of Microbial Ecology	CHP1 - Introduction
29-Jan	2b	Overview of Methods	
31-Jan	2c	Methods Exercise	Hall et al 2019
3-Feb	3a	Bacteria	
5-Feb	3b	Archaea	CHP 9 pp157-164; 167-175
7-Feb	3c	Hug et al. Discussion	Hugg et al.
10-Feb	4a	Fungi	Hawksworth and Lucking 2017
12-Feb	4b	Viral Ecology	Adam et al. 2017
14-Feb	4c	Shade et al. 2016 Discussion	Shade et al. 2016
17-Feb	5a	Plant Microbiome: Pankaj Trivedi	Chp. 8
19-Feb	5b	Autotrophy	Chp 4
21-Feb	5c	Commamox	Daims et al. 2015
24-Feb	6a	Heterotrophy I (Bulk processes and Drivers)-temperaturexresource	Chp 5; Chp. 6
26-Feb	6b	Heterotrophy II (Diverse Heterotrophic Pathways)	Chp. 11
28-Feb	6c	The Biogeochemical Engines of the Earth	Falkowski et al. 2008
2-Mar	7a	Biogeography and Adaptations	Chp. 3; Chp 9 164-167
4-Mar	7b	Evolution of Micororganisms (evolution as process and predictor)	
6-Mar	7c	Genomes to Biomes	DeLong 2009
9-Mar	8a	Review of Mid-Term Exam	no reading
11-Mar	8b	BLAST and alignment workshop tutorial/Phylogeny of Trees	no reading
13-Mar	8c	Specialist Taxa dominate microbial ecosystems	Louca et al. 2018
16-Mar	9a	<b>Spring Break</b>	
18-Mar	9b	<b>Spring Break</b>	
20-Mar	9c	<b>Spring Break</b>	
23-Mar	10a	Biochemical Differences in Microbial Biomass	Chp. 6; Chp. 2 26-32
25-Mar	10b	Isolates for microbial physiology/biogeochemistry	Giovannoni and Stingl 2007
27-Mar	10c	The Role Isolates in Microbial Ecology	Hagstrom et al. 2017
30-Mar	11a	Microbial Stoichiometry	Chp2
1-Apr	11b	Microbial Stoichiometry II	Chp2
3-Apr	11c	Microdiversity and Traits	Adam Martiny 2017
6--Apr	12a	Death and Decomposition: Guest Lecture J. Metcalff	Chp. 5
8-Apr	12b	Syntrophy and coupled metabolic systems	Morris et al. 2013
10-Apr	12c	A Berry Microbial Consortia	Wilbanks et al. 2017
13-Apr	13a	Microbial Symbioses	Chp 14
15-Apr	13b	Human Health and Microbiomes	
17-Apr	13c	The Ecology of the Microbiome	Coyte et al. 2015
20-Apr	14a	Biofilms	Chp. 3 51-52: Battin et al.
22-Apr	14b	Bioremediation	<b>TBD</b>
24-Apr	14c	Deep Horizon Oil Spill Microbial Ecology	Valentine et al. 2011
27-Apr	15a	Group I & Group II	TBD
29-Apr	15b	Group III & Group IV	TBD
1-May	15c	Recitation/Float	TBD
4-May	16a	Group V & Group VI	TBD
6-May	16b	Group VII & Group VIII	TBD
8-May	16c	Review or Synthesis/Float	TBD
11-May		Scheduled Final Exam	Lecture Room