



Summer Session 2017

BIO491 (Special Topics)

Aquatic Microbial Ecology

3 credits: Lectures, Labs, Field Work

Course dates: July 10–21, 2017 3 credits

Instructor: Dr. Matthew (Matt) Church

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<http://flbs.umt.edu/people>

Prerequisites: One year of college-level biology, chemistry, and mathematics or equivalents; or consent of instructor.

Course Description:

Aquatic Microbial Ecology is an intensive 2-week summer field course available to upper-level undergraduate students with interests in environmental microbiology and aquatic ecology. The course includes lectures, laboratories, and several field-based sampling trips. The course provides a conceptual foundation and hands-on field and laboratory training in modern methods in aquatic microbial ecology. Lectures, laboratories, field trips, and in-class discussions will be used to explore topics such as physiology and metabolism of aquatic microbes; methods and tools for assessing microbial diversity, biomass, and growth; and the role of microbes in biogeochemical cycles. Students will gain hands-on experience with both cultivation-based approaches and cultivation-independent methods for studying environmental microorganisms. The heavy field-based emphasis of the course is intended to provide an experiential learning environment.

Students will work in small groups (3–4 students per group) to oversee a mutually agreeable field-based project. The goals of these group projects are: 1) Elucidate similarities or differences in the types and activities of microorganisms inhabiting diverse aquatic environments, 2) Gain understanding of how microorganisms are influenced by and influence these environments, and 3) Obtain hands-on experience with field sampling, experimental design, and laboratory methods utilized for assessing the role of aquatic microorganisms in ecosystem processes. Course includes 4–5 field trips to sample diverse aquatic habitats (lakes, streams, glacial melt waters, etc.). Samples will be collected for subsequent analyses of microbial abundance, metabolic activity, and diversity.

Required Text: There are no required text books for the course; however, students will be assigned readings that include both primary literature and textbook chapters pertinent to the topics covered in class.

Course and Field Supplies/Equipment (*available for purchase at the FLBS Bookstore)

- Waterproof field notebook (Rite in the Rain 8.5" by 11")*
 - Lab notebook*; binder or clipboard (optional)*
 - Pencils*
 - Hot/cold mug*
 - Plastic, resealable containers for lunch pack-up
 - Laptop (highly recommended)
 - Warm jacket
 - Mess kit
 - Sleeping bag
 - Tent
 - Rain gear
 - Water bottle
 - Water purifier
 - Wading shoes and/or waders
 - Clothes that can get muddy
 - Flashlight or headlamp with batteries
 - Mask, fins, snorkel, wetsuit (all optional, but if you already have these, bring them!)
- Required Overnight Field Gear and Other Items to Bring Checklists: [\(Click to view\)](#)**

Student Learning Outcomes:

- 1) Gain conceptual and practical understanding of the discipline of aquatic microbial ecology.
- 2) Familiarity with the ecological role and function of aquatic microorganisms.
- 3) Define the major forms of aquatic microbial life and describe characteristics that distinguish these forms.
- 4) Define processes that control microbial abundances, growth, and diversity in aquatic environments, and gain familiarity with methods for measuring microbial biomass, productivity, and diversity.
- 5) Ability to apply basic methods and laboratory and field-based tools for the study of aquatic microbes.
- 6) Gain experience in presenting research to peers and colleagues.

Evaluation and Grading:

Grades will be earned based on three criteria:

- 1) Regular attendance and participation in course activities;
- 2) Performance on an oral (15 min total: 12 minute talk with 3 minutes for questions) presentation summarizing the group project/experiment; and
- 3) Completion and quality of laboratory write-ups summarizing the hands-on field and lab work. Students are expected to attend all lectures, discussions, labs, and field sampling trips and should be familiar with the required reading material.

Grades will be weighted as follows:

- 1) Attendance and participation in class lectures, discussions, and labs (20%),
- 2) Performance on oral presentation summarizing group projects (40%), and
- 3) Performance on write-ups of laboratory training exercises (40%).

Course Policies:**Schedule:**

Date	Lectures	Lab Topic	Field Site
10-Jul-17	Introduction to aquatic microbial ecology	Lake sampling; collection and initial processing of samples for Chl a, bacterial abundance, nutrients, productivity, DNA	Flathead Lake
11-Jul-17	Microbial bioenergetics and metabolic diversity	Productivity (photosynthesis-irradiance, bacterial production)	Swan Lake
12-Jul-17	Microbial control on aquatic carbon cycling	Microscopy and flow cytometry Lab: counting, visualizing cells	Swan River
13-Jul-17	Life at the microscale	DNA extractions/ Extract, analyze Chl samples	Flathead Lake diel
14-Jul-17	Photosynthesis and primary production	PCR amplification, gel purification, cloning	Flathead Lake diel
17-Jul-17	Measurements and distributions of microbial biomass	QPCR analyses of functional genes	Jewel Basin
18-Jul-17	Microbial diversity: Methods and patterns	Carbon and nutrient analyses	TBD
19-Jul-17	Microbial nitrogen cycling	Sequence analyses	TBD

20-Jul-17	The microbial loop and bacterial production	Calculations of biomass, synthesis of lab results	TBD
21-Jul-17	Student presentations		

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