Spring 2-1-2022

BIOE 428.00: Freshwater Ecology

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FRESHWATER ECOLOGY

Lecture: Tuesday & Thursday 9:30 – 10:50 am, HS 411
Lab: Thursday or Friday 1:00 – 4:50 pm; HS 102

Instructors:	**Email Contact:**	**Office Hours & Location:**
Winsor Lowe	winsor.lowe@umontana.edu	Wed 11 am – 12 pm or by appt; HS 410
James Frakes	jameson.frakes@umconnect.umt.edu	Thurs 11 am – 12 pm or by appt; BRB 013
Eric Lyons	eric.lyons@umconnect.umt.edu	TBD

Course Website: https://moodle.umt.edu/course/view.php?id=49375

Course Description: Offered spring. Prereq., BIOB 160N and either CHMY 123N or 143N.

Learning Goals, Objectives, & Outcomes: The primary objectives of this course are to understand the ecology of freshwater ecosystems and to gain practical skills for studying them. These will be accomplished through lectures, labs and field activities, and student exploration of topics through a literature review. By the end of the course, you should:

- understand the major physical, chemical, and biological factors characterizing freshwater systems
- understand how the abiotic and biotic factors interact to shape freshwater biodiversity, species interactions, and ecosystem processes
- know the main tools ecologists use to conduct research in freshwater systems and apply these tools to your own research question
- be able to analyze, summarize, and interpret quantitative data
- be able to collect, analyze, and interpret data of your own
- be able to communicate hypotheses and research through oral and written means

**Required Purchase:*
Lab & Field Notebook – we highly recommend a Rite-in-the-Rain notebook, available in the bookstore

Course Textbook (available online through UM library):
Freshwater Ecology: Concepts and Environmental Applications, by Walter K. Dodds, Academic Press, 2002, 829pp. ISBN 9780123858242

Grade Components: You will receive a single grade for the course (lecture and lab) that is comprised of the following:

20% = Mid-Term Exam, Tuesday, March 15, 9:30-10:50 am, cumulative, including lab material

25% = Final Exam, Wednesday, May 11, 8:00-10:00 am, cumulative, including lab material

30% = Review Paper*

- 5% = Prospectus: 200 - 300 words with 3+ citations (due March 1)
- 10% = Outline: 800 - 1000 words with 10+ citations (due March 31)
- 15% = Paper: 1500 - 2000 words with 20+ citations (due May 3)

25% = Lab & Field Studies**

Write-Ups (600 points): *For each of our four major lab activities you will turn in a mini write-up that includes: short background, question, hypothesis, short methods, written results, figure(s) and/or table(s), and main conclusions.*

Lab notebook (50 points): Due at the end of the semester to ensure you have been keeping quality field notes.

Collaborative Research Project (200 points): *You will develop, carrying out, and present your own research project. You will work in groups of 3 – 4 students and will be graded based on a research proposal (100 points) and presentation (100 points).*

* All written assignments will be double-spaced, in 12-point font.

** Please see Lab Syllabus for more information.

Grade Scale:
A 93-100%; A- 90-92%; B+ 87-89%; B 83-86%; B- 80-82%; C+ 77-79%; C 73-76%; C- 70-72%, D 60-69%, F <60%

Late Assignment Policy: Assignments are due in hardcopy form at the beginning of class unless otherwise stated. Any late assignment will result in a 5% grade penalty per day (e.g., 15 minutes after start of class = -5%, 3 days after class day = -20%, etc.) up to a 50% penalty. Late exams will not be given except under extraordinary circumstances. Please speak with me **directly** if you have difficulty meeting the assignment deadlines or exam dates.

***Relevant University Policies:** **Your instructor follows all University of Montana academic policies and procedures. A full description of these can be online.*

Accessibility Syllabus Statement: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.
Any questions please contact me.

Attendance: Students are expected to attend all class meetings and complete all assignments for courses in which they are enrolled. Instructors are encouraged to notify advisors or the appropriate administrators regarding students with excessive unexcused absences. Instructors may excuse brief and occasional absences for reasons of illness, injury, family emergency, religious observance, cultural or ceremonial events, or participation in a University sponsored activity.

Standards of Academic Conduct: *Students found in violation of academic conduct code will be reported and will not receive credit on the assignment(s) and/or entire course.*
Students at the University of Montana are expected to practice academic honesty at all times. All students should read the University of Montana Student Conduct Code available online at:
https://www.umt.edu/student-affairs/community-standards/default.php

Academic misconduct is subject to Academic Penalty (or penalties) by the course instructor and/or University Sanction(s) by the University through the Provost and Vice President for Academic Affairs. Academic misconduct is defined as all forms of academic dishonesty, including but not limited to:

- Plagiarism (including directly coping text, tables, graphs, or figures from fellow students)
- Misconduct during an examination or academic exercise
- Unauthorized possession of examination or other course materials
- Tampering with course materials
- Submitting false information
- Submitting work previously presented in another course
- Improperly influencing conduct
- Substituting, or arranging substitution, for another student during an examination or other academic exercise
- Facilitating academic dishonesty
- Altering transcripts, grades, examinations, or other academically related documents

Course Schedule (Subject to Change):

Week	Date	Topic	Reading	Assignment Due
1	Tues, Jan 18	Introduction to Freshwater Ecology		
	Thurs, Jan 20	Classification of Freshwater Systems	*Dodds Chpt 1*	
2	Tues, Jan 25	Properties of Water I	*Dodds Chpt 2 & 3*	
	Thurs, Jan 27	Properties of Water II	Dodds Chpt 2 & 3	
3	Tues, Feb 1	Lakes	*Dodds Chapt 6*	
	Thurs, Feb 3	Streams	*Dodds Chpt 5*	
4	Tues, Feb 8	Wetlands and Other Habitats	*Dodds Chpt 4 & 15*	
	Thurs, Feb 10	Catch-Up		
5	Tues, Feb 15	The Nitrogen Cycle	*Dodds Chpt 13*	
	Thurs, Feb 17	The Phosphorous Cycle	*Dodds Chpt 13*	
6	Tues, Feb 22	Carbon Cycles I	*Dodds Chpt 12*	
	Thurs, Feb 24	Carbon Cycles II	*Dodds Chpt 12*	
7	Tues, Mar 1	Primary Production I	*Dodds Chpt 17*	Prospectus
	Thurs, Mar 3	Primary Production II	*Dodds Chpt 17*	
8	Tues, Mar 8	Catch-Up		
	Thurs, Mar 10	Exam Review		
9	Tues, Mar 15	**Mid-Term Exam**		
	Thurs, Mar 17	No class		
10	Tues, Mar 22	SPRING BREAK		
	Thurs, Mar 24	SPRING BREAK		
11	Tues, Mar 29	Primary Producers	*Dodds Chpt 7 & 8*	
	Thurs, Mar 31	Animals I: Zooplankton	*Dodds Chpt 9*	Outline
12	Tues, Mar 5	Animals II: Aquatic Insects	*Dodds Chpt 9*	
	Thurs, Apr 7	Animals III: Amphibians	*Dodds Chpt 9*	
13	Tues, Apr 12	Population Ecology I		
	Thurs, Apr 14	Population Ecology II		
14	Tues, Apr 19	Catch-Up		
	Thurs, Apr 21	Community Ecology I	*Dodds Chpt 10, 19, 20*	
15	Tues, Apr 26	Community Ecology II	*Dodds Chpt 10, 19, 20*	
	Thurs, Apr 28	Community Ecology III	*Dodds Chpt 10, 19, 20*	
16	Tues, May 3	Ecosystem Ecology	*Dodds Chpt 22*	Review Paper
	Thurs, May 5	Exam Review		

LEARNING OUTCOMES

By the end of this course, I expect students to be able to do the following:

- Identify three key conceptual advances in freshwater ecology from the last 100 years.
- Describe the water cycle, global water budget, watershed concept, and major mechanism that create lakes and ponds.
- Identify and describe the properties of water that are most important to understanding broader patterns of habitat structure and ecology in freshwater systems.
- Describe the external and internal physical processes that determine how water moves in lakes and streams.
- Discuss some of the important consequences of water movement for other aspects of physical habitat in lakes and streams, and for species that inhabit these systems.
- Describe the concepts of trophic structure and primary production, identify the major groups of primary producers in freshwater ecosystems, and identify the major controls on primary production.
- Describe why nitrogen and phosphorus are important nutrients in freshwater systems, trace how nitrogen and phosphorus move through freshwater systems, and identify important ecological factors that influence movement and transformation of nitrogen and phosphorus.
- Describe how pH and alkalinity work, and discuss the forms and transformations of inorganic and organic carbon in freshwater systems.
- Describe the major groups of zooplankton in freshwater systems, including shared and distinguishing characteristics, and identify important controls on the distribution and abundance of freshwater zooplankton.
- Identify the important orders of insects in freshwater systems and describe their life cycles, feeding behavior, and key aspects of their ecology.
- Identify important groups of amphibians in North American freshwater systems and describe their life cycles, reproduction, habitat requirements, and patterns of diversity.
- Discuss basic controls on population ecology in freshwater systems and use the primary literature to identify specific mechanisms regulating population size and population dynamics.
- Identify major controls on species diversity in freshwater systems, mechanisms causing species composition to change over space and time, and the consequences of variation in species composition.
- Describe the “ecosystem concept”, review recent advances in our understanding of the ecosystem ecology of freshwater systems, and identify the ecosystem- and community-level implications of linkages between freshwater and terrestrial systems.