Spring 2-1-2019

BIOE 428.00: Freshwater Ecology

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Freshwater Ecology

BIOE 428

Spring 2019

Instructor: Winsor Lowe

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Office Hours: Tuesday 3 - 5 pm

Lab Instructor:	Kylla Benes	TAs: Maddy Cochrane	Anthony Lapsansky
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Course Content:

This course will focus on interactions among freshwater species and between these species and their aquatic environments. Lectures and readings provide the scientific background necessary for understanding the physical, chemical, and biological dynamics of freshwater habitats. Emphasis is placed on basic mechanisms controlling the distribution and abundance of freshwater species, and on application of fundamental concepts to problems in conservation and management of aquatic systems. The laboratory and field work are designed to acquaint students with the freshwater systems of Montana, and with methods for studying these systems.

Rooms and Times:

Lecture: Liberal Arts 203, Tuesday and Thursday, 10:30 - 11:50 am
Lab: Health Sciences 102, Thursday and Friday, 1:00 - 4:50 pm

Website: https://moodle.umt.edu/course/view.php?id=24734

Grading:

30% = Exams (2 of 3 @ 15% each), cumulative, including lab material
- The lowest non-final exam grade will be dropped
- If you miss an exam, that counts as the lowest grade

25% = Final Exam (Wednesday, May 1, 8:00-10:00 am, LA203), cumulative

20% = Review Paper*
- 3% = Prospectus: 200 - 300 words with 3+ citations (due Feb. 19)
- 5% = Outline: 800 - 1000 words with 10+ citations (due March 19)
- 12% = Paper: 1500 - 2000 words with 20+ citations (due April 23)

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

Text: Dodson, S.I. 2005. Introduction to Limnology. McGraw-Hill, NY.

Additional Readings: On course website

Grading Policy:
Late assignments will be penalized 10% per day to a maximum of 50%. Late exams will not be given except under extraordinary circumstances discussed with me **IN PERSON** prior to the exam. I encourage students with disabilities of any kind to discuss appropriate accommodations with me.

Field Trips:
These will include trips to streams, rivers, and ponds surrounding Missoula. Please dress for these trips assuming that you will get wet, cold, and sun burned.

Drops, Adds, Other Academic Changes, and Pass/Fail Policies:
The University's *Academic Policies and Procedures* are described at:
http://catalog.umt.edu/academics/policies-procedures/

This includes important dates regarding course registration, including drop/add deadlines.

Learning Outcomes

By the end of this course, I expect the students in this course 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.

Policy and procedure for accommodating disabilities:

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction for students with disabilities in collaboration with instructors and Disability Services for Students, which is located in Lommasson Center 154. The University does not permit fundamental alterations of academic standards or retroactive modifications.

Date	Topic	Readings, Assignments, etc.
Jan. 15	Course introduction and a short history of freshwater science	• Dodson, Chapter 1
Jan. 17	Classifications and origins of freshwater systems	• Dodson, Chapter 11 • Meyer et al. (2003) - Website
Jan. 22	Properties and behavior of H_2O I: The specifics	• Dodson, Chapter 2: 29-33 (to 'Dissociation of pH'), 38-39 (to 'Vertical Stratification')
Jan.24	Properties and behavior of H_2O II: The larger patterns	• Dodson, Chapter 2: 39-50 (to 'Water Movements')
Jan. 29	Water movement I: Lakes	• Dodson, Chapter 2: 50-56 • Term paper assignment
Jan. 31	Water movement II: Streams	• Allan, Chapter 1, Chapter 3: 45-69 - Website • Exam review
Feb. 5	**Exam 1: Materials up to and including Jan 31**	
Feb. 7	Primary production I	• Dodson, Chapter 9 • Allan, Chapter 4 - Website
Feb. 12	Primary production II	• None
Feb. 14	Chemical cycles I: Nitrogen	• Dodson, Chapter 10, 239-259 • Driscoll et al. (2003) - Website
Feb. 19	Chemical cycles II: Phosphorous	• Review Paper Prospectus Due
Feb. 21	Chemical cycles III: pH, Alkalinity, and Carbon	• Dodson, Chapter 10, 230-239 • Kalff, Chapter 14 - Website
Feb. 26	Chemical cycles IV: more pH, Alkalinity, and Carbon	• None
Feb. 28	Review Session for Exam 2	• None
March 5	**Exam 2: Materials up to and including Feb. 28**	

Date	Topic	Readings, Assignments, etc.
March 7	Zooplankton I	• Dodson, Chapter 3
March 12	Zooplankton II	• None
March 14	Freshwater macroinvertebrates I	• Dodson, Chapter 4
March 19	Freshwater macroinvertebrates II	• Wetzel, Chapter 22, 695-713 - Website • Review Paper Outline Due
March 21	Freshwater macroinvertebrates III	• None
March 26	Spring Break	
Marh 28	Spring Break	
April 2	Amphibians I	• Dodson, Chapter 5
April 4	Amphibians II	• Whiles et al. (2006) - Website
April 9	**Exam 3: Materials up to and including April 4**	
April 11	Populations I	• Dodson, Chapter 6
April 16	Populations II	• Allan, Chapter 10 - Website • Lowe et al. (2006) - Website
April 18	Communities I	• Dodson, Chapter 7 • Allan, Chapter 7 - Website
April 23	Communities II	• Dodson, Chapter 8 • Review Paper Due
April 25	Energy flows and terrestrial-aquatic linkages	• Baxter et al. (2005) - Website
May 1	**Final Exam, 8:00-10:00 am, LA203**	