Aquatic Invertebrate Ecology WILD 485

Location: ISB 008

Day and Time: Wed 12-4 PM

Instructor: Diana L. Six
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Office hours: Tuesdays 10-11:30 or by appointment
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OBJECTIVES: This course is designed to provide students an understanding of the life histories, ecology and importance of macroinvertebrates in freshwater aquatic systems. The primary focus will be on insects although an introduction to other invertebrates will also be included. The lab portion of the course will involve learning identification of major groups of aquatic macroinvertebrates and participation in an actual long-term environmental assessment using invertebrates as indicators of stream condition and restoration efficacy.

LEARNING OUTCOMES:
Successful students will be able to:

- Describe life histories, behaviors, trophic importance, adaptations, and ecological and conservation significance of aquatic invertebrates
- Identify aquatic macroinvertebrates to appropriate levels for ecological study and environmental sampling
- Understand and execute standard aquatic sampling protocols for aquatic macroinvertebrates

GRADING:
This course is traditional letter grade only. A standard grading scale will be used:

A	100-90%
B	89-80
C	79-70
D	69-60
F	68-0

Lecture section: One midterm, one final: each worth 25% of final grade
Lab section: worth 50% of final grade (see below for breakdown)

Expectations
Attendance is critical. No make-ups for exams without verifiable appropriate excuse. All assignment deadlines are absolute.
Field days are mandatory: We will have one Wednesday afternoon field trip and one one-day weekend field trip (see schedule).

Text-lecture: Aquatic Entomology, Lancaster, L. and Downes, B. J. Oxford University Press. 2013.

Text-lab: A Guide to Common Freshwater Invertebrates of North America. Voshell, J. R. Jr. McDonald & Woodward Press. 2002.

Lecture schedule

Sept 6 Intro to the course. The importance of macroinvertebrates in aquatic systems. The freshwater habitat. (Chap. 2, classic Vannotte paper)

Sept 13 **No class! (reading on biomonitoring)**

Sept 20 **Meet at Greenough Park at 12:30 sharp!**

SATURDAY Sept 23 Full-day field trip to sample invertebrates in Ninemile Creek – meet at Public Safety/Parking Services at 8AM SHARP!!!

Sept 27 Environmental constraints – gas exchange (Chap. 3)

Oct 4 Environmental constraints - physical-chemical gradients and extremes (Chap. 4)

Oct 11 Environmental constraints – biomechanics (Chap. 5)

Oct 18 MIDTERM

Oct 25 Trophic strategies, diet and digestion (Chap. 13, 14)

Nov 1 Development and reproduction (Chap. 10, 12)

Nov 8 Mating, signaling, oviposition and dispersal (Chap. 10, 11)

Nov 15 Population dynamics and persistence, population genetics (reading on population genetic structuring in streams)

Nov 22 **No class- Thanksgiving break**

Nov 29 Special topics 1: Anthropogenic effects (readings on mining and climate change)

Dec 6 Special topics 2: Restoration of the Clark Fork River – guest speaker Maury Valett

FINAL TBA

Lab section

Objectives: 1) To observe first hand, where aquatic macroinvertebrates occur in nature and how environmental conditions affect their distribution and abundance. 2) To gain experience in collecting and identifying aquatic macroinvertebrates. 3) To understand the use of macroinvertebrates in ecological studies and environmental assessments and to assess habitat quality.

Field trips: These are **mandatory** and an essential part of learning aquatic invertebrate ecology. These include class period when we will meet at Greenough Park in Missoula to learn methods for observing and collecting aquatic macroinvertebrates and one full-day weekend field trip to sample a stream as a part of a long-term study on stream restoration.

Grading: (50% of total grade – see above)

Lab exam	20%
Lab notebook	30%
Field project	40%
Presentation	10%

Lab notebook: The lab notebook is an essential part of learning macroinvertebrate taxonomy and identification. Directions in developing the notebook will be provided in a separate handout. The lab notebook is **due on Nov. 15. No late notebooks will be accepted.**

Field days: *We WILL be getting wet!!!* Bring fishing waders if you have them. I will have some to share. Wear shorts and bring closed-toed shoes you can wear in the water. 'Wet shoes' are best because they cling while protecting your feet. Closed-toes are important. You will be vigorously kicking rocks and sandals and bare feet are NOT up to the task! If you don't have any shoes that will work, pick up some old sport shoes at a thrift shop. On the full day field trip make sure you wear appropriate clothing for the weather, getting in the creek, and bring water and a lunch.

Lab exam: This exam will test your identification skills. It will consist of specimens that you will be expected to identify to order and family.

Field project: This project will introduce course participants to scientific sampling of streams and allow participation in an actual long-term study monitoring the efficacy of a stream restoration project being conducted by Trout Unlimited. During a full-day field trip, we will collect macroinvertebrate samples from various locations on a stream. The specimens in the samples will then be identified in subsequent lab periods. Once identifications are complete, the data will be entered into Excel and analyzed. A summary of the results will be developed into a final report presented on the last day of class.

Presentation: Groups from the field project will develop and present a 15 minute Powerpoint presentation of your stream sampling results to the class. This will allow everyone to hear what others found and also discuss and compare findings. We will have beverages and snacks!

Lab section topics

Sept 6 Introduction to lab section (Chap. 1 in Lecture text)

Sept 13 **No class** (Pp. 27-67 Lab text)

Sept 20 **Greenough Park – learning to observe and collect aquatic macroinvertebrates. Meet at the park at 12:30 SHARP!!!!**

SATURDAY SEPT. 23 – ALL DAY FIELD TRIP – meet at 8AM sharp at Public Safety/Parking Services

Sept 27 Taxonomy: Non-insect macroinvertebrates. Insect morphology.

Oct 4 Taxonomy: Insects: Hemiptera, Odonata. Work on project collections

Oct 11 Taxonomy: Insects: Plecoptera. Work on project collections

Oct 18 Taxonomy: Insects: Ephemeroptera. Work on project collections

Oct 25 Taxonomy: Insects: Trichoptera. Work on project collections

Nov 1 Taxonomy: Insects: Coleoptera, Diptera. Work on project collections

Nov 8 Taxonomy: Insects: Practice exam. Work on project collections/data entry

Nov 15 LAB EXAM. LAB NOTEBOOK DUE. Work on project collections/data entry/analysis

Nov 22 **No lab - Thanksgiving**

Nov 29 Work on completing projects and presentations

Dec 6 Projects due. Give presentations

General information for the course:

Students with Disabilities

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications.

Student Conduct Code

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

Course Withdrawal Deadlines

Important Dates Restricting Opportunities to Drop a Course Spring 2017:

September 21, 2017 (5:00 p.m.)	**Autumn Class Day 15**: ✓ **Last day to drop individual Autumn classes on CyberBear with refund** ✓ Last day to withdraw from Autumn (drop all courses) with a partial refund – see Withdrawal Policy below. ✓ Last day to add Autumn classes with electronic Override on CyberBear or paper Override form. ✓ Last day to change Autumn credits in variable credit courses & switch grade mode in CyberBear. ✓ Last day to change Autumn grading option to or from audit. ✓ Last day to buy or refuse UM's student health insurance coverage.
September 21, 2017 (5:01pm)	Any student not registered for at least one course (on schedule in CyberBear) must submit a Petition to Register & Pay After the Deadline. Petitions are reviewed weekly by committee and are not guaranteed approval.
September 22 – November 2, 2017 (5:00 p.m.)	**Through Autumn Class Day 45:** ✓ Autumn course adds & drops require a Course Add/Change or Course Drop form with instructor's & advisor's signatures. $10 fee applies. ✓ A 'W' will appear on the transcript for dropped classes. No refunds. ✓ Students can change variable credit amounts and grading options (**except audit**) using a Course Add/Change form with instructor's & advisor's signatures.

Classroom Environment Students at University of Montana are diverse in many ways, including race, gender, sexual orientation, age, religion, preparedness, and mobility. Please respect other students and their perspectives. The university's position is: "*The University of Montana respects, welcomes, encourages, and celebrates the differences among us. In recognition of this commitment, we value all members of the campus community, not in spite of, but because of their differences. A campus that expects, reflects, and respects diversity influences the way our students perceive the world. A diverse campus community enriches all of us with a greater understanding of the human condition and the challenges all people must confront in a rapidly changing, increasingly globalized, and ever more interdependent world society.*"