



ZOO*3700 Integrative Biology of Invertebrates

Fall 2018
Section(s): C01

Department of Integrative Biology
Credit Weight: 0.50
Version 1.00 - August 24, 2018

1 Course Details

1.1 Calendar Description

This course explores variation in physiology, reproduction and life history among invertebrates, and the role of invertebrates in marine, freshwater and terrestrial ecosystems. Through field experiences, lab study and a class experiment, we will examine the diverse solutions that invertebrates have evolved to live in very different environments, including: circulation and gas exchange; feeding and digestion; osmoregulation and excretion, nervous system and sensory structures; locomotion and biomechanics, and invertebrate communities.

Pre-Requisite(s): ZOO*2700

1.2 Course Description

In the prerequisite for this course, ZOO*2700, you learned about the unity and diversity of invertebrate taxa in an evolutionary context. In this course, you will explore a variety of functional and ecological concepts that will illuminate the biology of invertebrates in far greater depth. The course is organized around a series of major biotic and abiotic "challenges" that invertebrates face and how they overcome these challenges. This course will help you build a solid foundation of knowledge of invertebrate diversity, ecology, and function that you will build upon in higher-level courses. You will also have the opportunity to develop critical skills such as scientific writing, oral presentations, critical reading of primary literature, and methods of scientific inquiry.

1.3 Timetable

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructor(s)

Andreas Heyland

Email: aheyland@uoguelph.ca
Telephone: +1-519-824-4120 x56459

Office: SC1 1468
Office Hours: By Appointment

2.2 Instructional Support Team

Lab Co-ordinator: Shaylah Tuttle-Raycraft
Email: stuttle@uoguelph.ca
Telephone: +1-519-824-4120 x58096
Office: SSC 2447
Office Hours: By appointment

3 Learning Resources

3.1 Required Resource(s)

Invertebrates (Textbook)

Brusca RC, Moore W, Shuster SM. Invertebrates, 3rd ed. Sinauer. (new for 2017)

Lab Manual (Lab Manual)

ZOO*3700 Invertebrate Zoology Laboratory Manual – You must purchase this prior to the beginning of lab 1. Details will be made available in week 1.

Dissecting Kit (Equipment)

Available from the University Bookstore

Bound Lab Notebook (Equipment)

Available from the University bookstore.

Courselink (Website)

<https://courselink.uoguelph.ca>

This course will make use of the University of Guelph's course website on D2L (via Courselink). Consequently, you are responsible for all information posted on the Courselink page for ZOO*3700. Please check it regularly.

TopHat (Website)

<https://tophat.com/>

Weekly quizzes and self assessment

PEAR Review System (Website)

<https://peartool.opened.uoguelph.ca/>

Automatic access from courselink

3.2 Recommended Resource(s)

Invertebrate Zoology: A Functional Evolutionary Approach (Textbook)

Ruppert EE, Fox RS, Barnes RD. Invertebrate Zoology: A Functional Evolutionary Approach, 7th ed. Thomson.

On reserve.

The Invertebrates: A Synthesis (Textbook)

Barnes RSK, Calow P, Olive PJW, Golding DW, Spicer JI. The Invertebrates: A Synthesis, 3rd ed. Blackwell Science.

On reserve.

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Differentiate major patterns by which invertebrates carry out critical functions such as:
 - Gas exchange and circulation
 - Water regulation, ion regulation, and excretion
 - Nutrition and digestion
 - Sensing and responding to the environment
 - Interacting with the physical environment and locomotion
 - Reproduction and development
 - Finding food and avoiding predators and parasites
 2. Discuss the mechanisms that led to the diversity of these patterns, including the process of natural selection.
 3. Identify the ecological roles played by key groups of invertebrates
 4. Identify and classify invertebrates using practical skills
 5. Prepare and communicate scientific ideas, including:
 - Scientific writing
 - Oral communication
 6. Formulate research questions by practicing the process of biological inquiry using the scientific method including testing predictions of falsifiable hypotheses.
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5 Teaching and Learning Activities

5.1 Course Content

The lab and lecture components of this course are inseparable and it will be very difficult for you to succeed in this course if you neglect either of them. We will post a skeletal outline of lectures the night before they are given. These are by no means a substitute for taking notes; rather they should be used as a way of preparing for the lectures in concert with the appropriate material in the textbook. We will also post a list of "Study Questions" on CourseLink that will give you examples of the kinds of questions you should be able to answer after that lecture. We also expect you to come prepared to the lab sessions. Please read the lab outline prior to that week's lab and bring your dissection kit each week.

Some labs will take place outside of the Science Complex at both the University of Guelph Arboretum and the Aqualab (or other locations). Students must dress appropriately and must review the field safety protocols outlined in the lab manual before engaging in these activities.

5.2 A Note on Evolution and Phylogenies

The most important unifying theme of this course and ZOO*2700 is that the diversity and unity

of invertebrates can best be explained by the theory of **Evolution by Natural Selection**. It is therefore critical that you understand this process. There has been great progress made even in the last ten years in elucidating the structure of the tree of life, and we will use the most recent phylogenies available for this course. This phylogeny conflicts in places with trees presented in your textbook, and in these cases, the phylogeny presented in lecture will take precedence. You should be aware that biologists are always collecting more and more phylogenetic data and carrying out more sophisticated analyses, so even this up-to-date tree will likely change in your lifetimes.

5.3 Laboratory Notebooks

Each of you should maintain your own Lab Notebook. It will serve as a written record of everything you do in the lab and will include observations, data sheets, drawings, questions, insights, ponderings, and aha moments. It will serve as an invaluable study tool for exams. Your lab notebook will NOT be graded.

5.4 Schedule

Week	Date (week of)	Lecture Topic	Lab Topic
	Sep 7	Course overview	
1	Sep 10	Review of invertebrate evolution and taxa. Marine and planktonic invertebrates.	1. Plankton, marine invertebrates 1
		Terrestrial invertebrates	
2	Sep 17	Surface area to volume ratios Energetics and metabolism	Class Experiment
3	Sep 24	Gas exchange Circulation Excretion	2. Terrestrial Invertebrates
4	Oct 1	Osmoregulation Ionoregulation	Class Experiment
5	Oct 8 Thanksgiving study break	Feeding and digestion	NO LABS THIS WEEK
6	Oct 15	Sensing and responding	3. Gas exchange

Midterm Lecture Exam

Oct 19

7	Oct 22	Adaptation to the physical environment	4. Nutrition and digestion
8	Oct 29	Locomotion	5. Sensing and responding to the environment
9	Nov 5	Insect Physiology I	6. Biomaterials, biomechanics, and locomotion
10	Nov 12	Insect Physiology II	Lab Exam
11	Nov 19	Coevolution Predator-prey interactions	NO LABS THIS WEEK
12	Nov 26	Symbioses Bio-Inspired Design	Oral presentations

5.5 Important Dates

Date	Event	Time / Location
Sep 7	First class	MCLN 102
Sep 11/12	First labs	SSC 2314
Oct 8	Thanksgiving	NO CLASSES
Oct 9	Fall study break	NO LABS THIS WEEK
Oct 19	Midterm Exam 1	
Oct 26	Lab report – first draft due	ONLINE by 11:00 PM
Nov 2	Lab report – peer review due	ONLINE by 11:00 PM

Nov 2 40th class day last day to drop 1-semester courses

Nov 9 Lab report – final version due ONLINE by 11:00 PM

Nov 13/14 **Lab Exam**

Nov 20/22 NO LABS THIS WEEK

Nov 27/28 Oral presentations SSC 2314

6 Assessments

6.1 Methods of Assessment

In all cases, students will be expected to write using complete sentences and proper grammar. **All students are expected to complete and submit work individually unless otherwise stated.**

Form of Assessment	Value (%)	Date	Learning outcome addressed
Lab Report		ONLINE by 11:00PM	
first draft (50%)	20	Oct 26	5
peer review (20%)		Nov 2	
final copy (30%)		Nov 9	
Midterm Exam 1	20	Oct 19 IN LECTURE	1, 2, 3, 5, 6
Final Exam	20	TBA	
In Lecture Quizzes	10		
In Lab Worksheets	5		
Lab Exam	15	Nov 13/14 IN LAB	1, 2, 3, 4
Oral/video presentation	10	Nov 27/28 IN LAB	5

6.2 Lab Report

The report will consist of a formal write-up of an experiment that we will plan and carry out together as a class. We have reserved two full weeks of lab for the execution of your experiment. The assignment consists of several components including a first draft, final draft and peer review. Students will work in pairs to submit the first draft and final report. Students will complete the peer review individually.

Late submissions will be penalized 20% each day that they are late. First drafts of the report submitted after the deadline will not be peer-reviewed. Students who submit the first draft late will not be able to review the paper of another student, and will thus forfeit the marks for the peer-review portion of the assignment.

6.3 Lab Exams

One lab exam will be given during the lab period in week 10 and will be worth 15% of the final mark. The lab exam will cover material from all labs, including the class experiment. Students must write the exam during their scheduled lab period. **No make-up exams will be given.** If a student fails to write the lab exam, a request for academic consideration with supporting documentation must be submitted to the instructor within 5 working days of the missed exam. If approved, the final exam will be weighted at 35%.

6.4 Midterm Exam

The midterm exam will cover lecture content only and will take place during the lecture period. The exam may consist of multiple choice and short answer questions. **No make-up midterm exam will be given.** If a student fails to write the midterm exam, a request for academic consideration with supporting documentation must be submitted to the instructor within 5 working days of the missed exam. If approved, the final exam will be weighted at 40%.

6.5 Oral/Video Presentation

Students will work in groups of 2 or 3 to prepare a presentation on a recent paper in the scientific literature on invertebrates. Presentations can take the form of a video presentation or an oral presentation during lab. Further details will be provided in lab.

6.6 Final Exam

The final exam will be written during the final exam period and will cover lecture material. The exam may consist of multiple choice questions, short answer, and longer essay questions. If a student misses the final exam, a request for academic consideration including documentation must be submitted to the Program Counsellor within 5 working days of the missed exam.

6.7 Note

[Assessment standards](#) for this course follow the definitions given in the 2018-2019 Undergraduate Calendar

7 Course Statements

7.1 Use of Animals

This course uses selected invertebrates for dissection. The University is committed to principles of conducting research and teaching in accord with the highest ethical standards. The use of

animals in research and teaching is a critical aspect of the work of the University of Guelph. The Department of Integrative Biology is committed to minimizing the use, pain, and suffering of animals used for teaching, and ensuring that the animals used receive care and treatment that meets or exceeds the standards outlined by provincial guidelines and statutes, and by the Guidelines of the Canadian Council on Animal Care. For more information, consult the [University Animal Care Policy](#).

7.2 Missed Lectures & Labs

If you are absent from lectures or labs during the semester, you will be expected to make up the missed material on your own.

7.3 Late Policy

Lab Report and Peer Review: Late submissions will be penalized 20% each day that they are late. First drafts of the report submitted after the deadline will not be peer-reviewed. Students who submit the first draft late will not be able to review the paper of another student, and will thus forfeit the marks for the peer-review portion of the assignment.

Requests to the Instructor for short extensions may be considered, but only if they are made **at least 36 hours before the submission deadline**.

7.4 Missed Lab & Midterm Exams

A make-up midterm exam will not be given. If a student fails to write the midterm exam, a request for academic consideration with supporting documentation must be submitted to the instructor within 5 working days of the missed exam. If approved, the final exam will be weighted at 40%.

Make-up lab exams will not be given. If a student fails to write the lab exam, a request for academic consideration with supporting documentation must be submitted to the instructor within 5 working days of the missed exam. If approved, the final exam will be weighted at 35%.

Final Exam: If a student misses the final exam, a request for academic consideration including documentation must be submitted to the Program Counsellor within 5 working days of the missed exam.

8 Department of Integrative Biology Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the [Learning Commons](#) including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: [Chemistry & Physics Help](#) and [Math & Stats Help](#)

8.3 Wellness

If you are struggling with personal or health issues:

- [Counselling Services](#) offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
 - [Student Health Services](#) is located on campus and is available to provide medical attention.
 - For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to [stress management and high performance situations](#).
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9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

9.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.
