

UNIVERSITY OF CALGARY  
DEPARTMENT OF BIOLOGICAL SCIENCES  
COURSE OUTLINE

1. Course: **ZOOLOGY 475 - THE INVERTEBRATES**

Lecture Sections: L01 MWF 11:00 SA 245 Fall 2017

Labs: B01/02 R 9:00/13:00 BI 046

**Instructor:** Dr. Mindi Summers BI 041 403-220-8761 mindi.summers@ucalgary.ca

**D2L:** [ZOOOL 475 L01 - \(FALL 2017\) - THE INVERTEBRATES \(F2017ZOOOL475L01\)](http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)  
Biological Sciences Department BI 186; (403) 220-3140; [biosci@ucalgary.ca](mailto:biosci@ucalgary.ca)

2. **Prerequisites:** Zoology 375. See section 3.5.C in the Faculty of Science section of the online Calendar (<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

3. **Grading:** The University policy on grading and related matters is described in “Academic Regulations, sections F.1 and F.2” of the online University Calendar (<http://www.ucalgary.ca/pubs/calendar/current/f-1.html> and <http://www.ucalgary.ca/pubs/calendar/current/f-2.html>) In determining the overall grade in the course the following weights will be used:

Individual manuscript writing, presentation, & review	20 % (submit on D2L before 7:59 am Nov 27)
Team manuscript & review; team presentation	20 % (submit on D2L before 7:59 am Dec 4; presentation in class Dec 6/8)
In-class quizzes (2 x 10%)	20 % (in class on Oct 13 and Nov 8)
Reading and annotated bibliography assignments (7 x 2.5%)	17.5 % (submit on D2L before 7:59 am on date due)
Laboratory notebook	10 % (submit in lab Nov 30)
Seminar reflections	5 % (submit on D2L before 7:59 am on date due)
In-class assignments	5 % (submit in class as announced)
Surveys	2.5 % (submit on D2L as announced)

Your letter grade for the course will be determined by summing the weighted numerical scores earned for each component listed above and converted using the table on the course outline and posted on the D2L site for the course. **Note:** Letter grades are not determined for any individual component but the table may be used to give you an approximate sense of your standing during the term.

<b>Final Grade Scale :</b>	A+: 95 or higher
	A : 90 and under 95
	A- : 85 and under 90
	B+: 80 and under 85
	B : 75 and under 80
	B- : 70 and under 75
	C+: 67 and under 70
	C : 63 and under 67
	C- : 60 and under 63
	D+: 55 and under 60
	D : 50 and under 55
	F : <50

4. **Missed components of term work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>

5. **Scheduled out-of-class activities:** Dates and times of class exercises held outside of class hours: **None**  
**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.**

6. **Online course components:** In the lecture component of the course, we will use the Top Hat classroom performance system, where you will be asked to use a cell phone or tablet to text answers to questions during class. The use of the Top Hat system is optional, but highly recommended to enhance learning in the classroom. If you answer 85% or more of the in-class questions, your lowest grade on ONE of your completed reading or seminar reflection assignments will be replaced by 100%. If you answer less than 85% of the in-class questions, a grade of 0 will be assigned for this course component, and no marks will be replaced. It is your responsibility to ensure that your participation is being properly recorded by the Top Hat system. In the event of any discrepancy, you must contact the administrators of the Top Hat system to have them corrected. Correction of any discrepancies must be done prior to 5pm on December 8, 2017. If you are unable to use the Top Hat system, please contact Dr. Mindi Summers within the first week of class to make alternate arrangements.

7. **Examination policy:** No electronic or written aids (e.g. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper.

Students should also read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

8. **Writing across the curriculum statement:** In this course, the quality of the student's writing in various written components will be a factor in the evaluation of those components. See also <http://www.ucalgary.ca/pubs/calendar/current/e-2.html>
9. **Ethics in the Biological Sciences:** Studies in the Biological Sciences involve the use of living and dead organisms. Students taking laboratory- and field- based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping. See <http://www.ucalgary.ca/pubs/calendar/current/sc-5-1.html> and also <http://www.ucalgary.ca/pubs/calendar/current/e-5.html>

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

10. **Human studies statement:** If you agree, your course work may be used for research purposes. Your responses will remain anonymous and confidential. Grouped data (no individual responses) may be used in academic presentations and publications. Participation in such research is voluntary and will not influence grades in this course. Students' signed consent forms will be withheld from instructors until after final grades are submitted. More information will be provided at the time student participation is requested. See also Section E.5 of the University Calendar.

#### 11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties.
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities\\_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf).

Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email [addy@ucalgary.ca](mailto:addy@ucalgary.ca) or phone 403 220-3140.

- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: [suypaca@ucalgary.ca](mailto:suypaca@ucalgary.ca)  
SU Faculty Rep. Phone: 403 220-3913 Email: [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca);  
Student Ombuds Office: 403 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca); <http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

# ZOOLOGY 475 – THE INVERTEBRATES

## COURSE OUTLINE

### Instructor

Dr. Mindi Summers

Office: BI 041

Phone: 403-220-8761

Email: [mindi.summers@ucalgary.ca](mailto:mindi.summers@ucalgary.ca)

Email is the preferred method of communication for questions and ideas. I will do my best to read and respond to emails within 24 hours Monday-Friday. I will try to respond to emails received during the weekend by the following Tuesday.

### TA

Contact information for the TA will be posted in D2L and provided at the first laboratory session.

### Office hours and open labs

Students are invited to discuss the assignments, lecture, laboratory, and other invertebrate-related topics during open labs and office hours held on one hour before and after each Thursday lab and on Fridays from 8:00-11:00am and 12-4pm in BI 046. The day and times for open labs may change based on student requests – the most up to date times can be found on D2L. I also welcome discussion immediately after lecture on Monday, Wednesday, and Friday, and by appointment. Please schedule an appointment directly at: <https://summers.youcanbook.me/>.

### Required and recommended texts and other supplies

Required textbook: None

Recommended textbook: Wilson, JS. & Carril, O.J.M. The bees in your backyard: a guide to North America's bees. ISBN: 978-0691160771.

Required other supplies: Dissecting equipment.  
Two bound laboratory notebooks (these can be reused from another course):  
a) one notebook should have carbon-copy pages;  
b) one notebook should have blank pages.

### Course D2L site

**D2L:** [ZOOL 475 L01 - \(Fall 2017\) - THE INVERTEBRATES \(F2017ZOOL475L01\)](#). This website will have the most updated schedule, homework assignments, readings, and slides and materials. You will also use D2L to complete your homework.

### Course description

In this course, you will work on a research team to conduct authentic research in invertebrate zoology and produce novel, publishable findings. You will communicate this work through a research manuscript formatted for an appropriate scientific journal and a conference-style presentation. Lectures, laboratories, and outside-of class assignments are designed so that you will be exposed to current research in the field, develop an understanding and proficiency in current scientific techniques, and discuss and experience methods and best practices of scientific peer review and dissemination.

### Course goals

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

- 1) Conduct a thorough literature review, design a research question, collect evidence, and analyze data to produce publishable scientific findings.
- 2) Communicate your research in the form of a ten-minute research presentation and manuscript.
- 3) Critically evaluate, review, and discuss research findings produced by others.
- 4) Identify a select group of invertebrates using morphological and/or molecular techniques, including DNA extraction, PCR amplification, Sanger sequencing, and bioinformatics analysis (e.g., BLAST, distance, and phylogenetic inference).

### Research teams

In this class, you will be working within a five-person research team within the lecture and laboratory sections. This team will submit one research manuscript and deliver a presentation, worth 20% of your overall course grade. Research teams will also re-take the multiple-choice section of the two in-class quizzes. Both quizzes will be first taken individually (worth 90% of each grade) and then as a team (worth 10% of each grade). If your individual score is higher than the team score, your individual score will be 100% of your quiz score. Please note that there is no final exam for this course.

Please immediately report any team-related difficulties or concerns to the instructor.

### Grading

Descriptions, marking rubrics, and due dates for assignments and other graded materials will be posted on D2L. The overall course grade will be determined as described on page 1.

## Tentative Schedule for Zoology 475

The most up-to-date class topics, readings, and assignment information can be found on D2L.

WEEK	TOPIC	ASSIGNMENTS
1 Sept 11-15	M Biodiversity and course overview W Biodiversity discovery, research, and collaboration Th Lab 1: Collecting, sorting, and storing biological samples for biodiversity research F Finding biodiversity literature, data, and records ( <b>meet in library</b> )	In-class #1
<b>Theme 1: Species diversity</b>		
2 Sept 18-22	M Taxonomic impediments and progress in biodiversity knowledge W Bee diversity, sample collection, and identification Th Lab 2: Sorting and identifying Albertan bees F <i>Friday seminar series – Lincoln Best, TBD</i>	*Survey 1 & Assign. 1
3 Sept 25-29	M DNA barcoding – methodology and progress W DNA extraction methodology Th Lab 3: DNA extraction F PCR amplification and sequencing methodology	*Seminar 1 & Assign. 2
4 Oct 2-6	M Scientific research teams and collaboration: merging molecules and morphology W Species descriptions Th Lab 4: PCR and morphological measurements for species descriptions F <i>Friday seminar series – Ralph Cartar, “Life and death in foraging worker bumble bees”</i>	*Assign. 3; In-class #2
5 Oct 9-13	M No class - University holiday W Identification using DNA barcoding and the “barcoding gap” Th Lab 5: Sequencing preparation F <b>Quiz 1: Species diversity</b>	*Seminar 2
<b>Theme 2: Phylogenetic diversity</b>		
6 Oct 16-20	M Phylogenetics and tree-thinking W Phylogenetic inference, characters, and alignment Th Lab 6: Character alignment / DNA extraction F <i>Friday seminar series – Paul Galpern, “Risks to pollinators: from crops to climate change”</i>	*Survey 2 & Assign. 4
7 Oct 23-27	M Parsimony W Model approaches: maximum likelihood Th Lab 7: Tree inference and taxonomy / PCR F Combining data – gene trees to species trees	*Seminar 3 & Assign. 5
8 Oct 30-Nov 3	M Historical biogeography and phylogeography W Morphological character analysis and comparative phylogenetic methods Th Lab 8: Morphological character analysis and phylogeography / Sequencing preparation F <i>Friday seminar series – Jess Vivruck, TBD</i>	*Assign. 6
9 Nov 6-10	M Molecular evolution: clocks, extinctions, diversification, innovations, and coevolution W <b>Quiz 2: Phylogenetic diversity</b> Th Lab 9: Phylogenetic methods synthesis F No class - University holiday	*Seminar 4
<b>Theme 3: Disseminating biodiversity knowledge</b>		
10 Nov 13-17	M No class - University holiday W Project proposal and writing agreement Th Lab 10: Group-specific data collection F <i>Friday seminar series – Conference-style symposium</i>	*Survey 3 In-class #3
11 Nov 20-24	M Scientific review and publishing W Scientific presentations: conferences and seminars Th Lab 11: Generating effective figures F Story-boarding/outlining: scientific manuscript and presentation	*Seminar 5 & Assign. 7  In-class #4
12 Nov 27-Dec 1	M Team writing/reviewing W Team writing/reviewing Th Lab 12: Team writing/reviewing F Group peer review	*Individual man/pres/review  Lab notebook In-class #5
13 Dec 4-8	M Course synthesis W Research symposium F Research symposium	*Team manuscript & Survey 4 Team presentations 1-4 Team presentations 5-8

(\*) Indicate assignments that must be submitted before class on Mondays (7:59 am).