

**University of Guelph  
College of Biological Science  
Department of Integrative Biology**

**COURSE OUTLINE**

**Marine Biology and Oceanography (ZOO\*4300)  
Fall 2017**

**Course description**

This intensive two-week course is held in early August at the Huntsman Marine Science Centre, St. Andrews, New Brunswick. The ecology, behaviour, physiology, biochemistry, biomechanics of marine plants and animals will be studied as well as basic oceanographic techniques. Students will be able to familiarize themselves with the techniques and equipment involved in various branches of marine biology and oceanography. In addition to regular tuition fees, students are responsible for the cost of transportation to St. Andrews, and for charges levied by the Huntsman Marine Science Centre for room and board. These fees are paid to Student Finance and Awards of the University of Guelph. A department application form must be submitted for approval before course selection. The signature of the course coordinator is required to select the course. This course must be recorded as part of your Fall course selection and tuition and compulsory fees will be calculated accordingly. Students taking this course DO NOT use course numbers reserved for Ontario Universities Program in Field Biology.

Credit weighting: 0.75

Prerequisites: BIOL\*3450, ZOO\*2700, (1 of STAT\*2230 or STAT\*2040 is strongly recommended)

**Teaching team**

Professor	Beren Robinson: <a href="mailto:berenrob@uoguelph.ca">berenrob@uoguelph.ca</a> ; SSC 2455
Instructors	Matt Cornish: <a href="mailto:mcornish@uoguelph.ca">mcornish@uoguelph.ca</a> ; AQUA 140
	Sheri Hincks: <a href="mailto:shincks@uoguelph.ca">shincks@uoguelph.ca</a> ; SSC 3509
	Peter Smith: <a href="mailto:pssmith@uoguelph.ca">pssmith@uoguelph.ca</a> ; SSC 3313

**Course schedule**

Lectures / Labs / Field trips - Take place roughly the first 15 days of August each summer at the Huntsman Marine Science Centre, St. Andrews, NB.

Student research proposals and reports are due outside of this interval as shown in the schedule below.

**Learning Outcomes**

By the end of this course, students should be able to address the following goals and perform the following skills:

**Conceptual Goals**

1. Explain how properties of environmental gradients govern life in estuaries and across the intertidal shoreline zone.
2. Explain the role that tides play in causing environmental gradients to fluctuate in space and time in estuaries and across the intertidal shoreline zone.
3. Explain the origins of soft sediments that dominate in estuary ecosystems; how inputs of detritus from external ecosystems rather than local primary productivity make estuaries one of the most

productive ecosystems on earth; and why most estuarine invertebrates are generalist deposit feeders.

4. Recognize that most top predators are highly mobile in estuaries and on intertidal shorelines and how this influences energy flow and species distributions in the system.
5. Discuss how habitat heterogeneity, fluctuating salinity and species interactions govern the distribution and abundance of organisms in estuarine and shoreline habitats.
6. Observe real animals (alive or dead) or their component parts to pose questions about form and function that motivate self-directed research leading to enhanced understanding of process in animal biology.

### **Skills Goals**

7. Practice rigorous data collection and recording skills in the field for subsequent analysis.
8. Gain experience at proper techniques for handling live animals and tissues that minimize stress and so improve the accuracy and reliability of observation.
9. Distinguish mechanistic research (why/how is it there?) from descriptive research (who/what is there?).
10. Apply the scientific method, and gain facility with making observations, sampling techniques, and hypothesis and prediction development.
11. Use your understanding of ecological and/or physiological processes from prior courses to create a research study that advances understanding about an ecological/physiological processes in a local natural system or organism.
12. Critically evaluate the scientific and societal value of potential research questions.
13. Analyze scientific literature in order to motivate and contextualize your research question, hypotheses and conclusions.
14. Incorporate uncertainty during the design and implementation of a research study. This means measuring, testing, accounting for, and acknowledging uncertainty throughout the scientific process.
15. Use prior knowledge from statistics courses to summarize, compare and communicate patterns in collected data and evaluate the quality of evidence. Extract, interpret and/or create complex graphical information that represents important physical and chemical properties of aquatic environments and use these to infer important processes that structure these ecosystems.
16. Practice logic- and evidence-based approaches to reach defensible conclusions.
17. Collaborate to answer research questions.
18. Communicate science effectively by speaking and writing about your original research contribution.
19. Practice writing 'with the reader in mind', including mastery of structural and grammatical tools to effectively communicate the rationale and importance of your study, and the implications of your findings.

### **Course Resources**

CourseLink ZOO\*4300 will make use of the UoG CourseLink website where we will make available materials, announcements of course news, deadlines etc. Please check it regularly.

Textbooks Course Manual (see CourseLink).

Recommended:

Ecology of aquatic systems, 2ed.; M. Dobson and C. Frid 2009, particularly chapters 4 & 5 (textbook of BIOL\*3450).

Seashore life of eastern Canada. A guide to identifying intertidal marine species. J. Cornall & G. Simard. Nimbus Pub. Ltd. 2014. ISBN 978-1-77108-182-5 (can be purchased through Amazon)

**The purchase of a laboratory or similar notebook is required** so that you can record all aspects of your progress while designing, pursuing and completing all field exercises and your independent research project. Record everything in your research note book:

- information about your collaborators and how to contact them
- all observations while in the lab and field and all data collected (neatly and in an organized fashion)
- calculations for data analysis, preliminary and final graphical results
- references, analyses and summaries of relevant scientific literature that you will source and include in your written reports
- all of your thinking as you design your research question, hypotheses and predictions, methods, identify and solve problems throughout, interpret your statistical results and come to conclusions about your study.

Notebooks with graph paper for drawing graphs of analyzed data will be the most useful.

Field/Laboratory notebooks will be graded on the last Friday of the course. In general, everything that you have thought during the development, pursuit and completion of each field exercise and your independent research project should be visible in your notebook under descriptive headings (HINT: divide your note book into sections for each exercise / research project). We will look for evidence of a 'narrative' that shows a beginning (e.g., goals/questions/hypotheses/predictions, etc.) – middle (method and pursuit of data and relevant literature, etc.) – and end (analyses, conclusions, uncertainties, etc.) for your projects. You will start using this book even before you arrive, as you organize your thinking about your research proposal! The absence of these elements in your notebook will generally result in lower grades. Your notebook is a 'road map' roughly showing your engagement with and thinking about all aspects of your research. IT WILL ALSO BE AN ENORMOUS HELP WHEN YOU WRITE YOUR FINAL RESEARCH REPORT after you leave the course. The more complete and expressive of your creativity, the better.

Undergraduate Calendar is the source of all information about UoG procedures, policies and regulations.

See: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>

## Course Content

This is an immersive field biology experience and students are expected to participate in all elements of the experience at all times while on course. Aspects of the ecology, behaviour, physiology, biochemistry and genetics of marine organisms will be studied as well as basic oceanographic techniques. The course is divided into 2 weeks with different activities. In week 1, students will perform group exercises to study community structure in various intertidal environments as well as boat cruises to collect plankton, benthic invertebrates, marine fish and to observe marine mammals (we focus here on 'what is out there' type questions). In week 2, students will perform independent research projects on a subject of their choice (contingent on instructor approval). The focus shifts to 'why this aspect of nature is the way it is' (see instructions for the research proposal). The course provides opportunities for students to become familiar with the major coastal communities and techniques used to study coastal marine biology and oceanography. Note that all research is performed within an explicit ecological context. This means that the research goals of independent research projects must always be presented so as to understand how or why the organism operates within the estuarine or intertidal environment the way that it does.



## General schedule

Week	Topics	Materials
1	Five field exercises sampling for diversity and abundance: Soft intertidal; rocky intertidal; mixed intertidal; benthic trawling; pelagic water column. Group project reports due daily in the evening of the first week.	Course workbook
2	Independent field research project	
Post field	Students analyze and complete individual project reports (see due dates below)	Field note book

## Methods of Assessment

Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcome Addressed
Group Project reports	40%	Aug 5	Field Exercises	1-5; 7-8; 14-19
Field books	5%	Aug. 11	Field Exercises & research	6-7; 15-16
Participation	5%	Aug. 11	Clean up	17
Individual: Proposal	5%	June 23	Field research	6-19
Oral present.	5%	Sept. 15		
Final paper	40%	Sept. 29		

This IS a senior research related course and so students are expected to demonstrate participation, attention to detail and scientific understanding at the 4000 credit level. Assessment is based on students practicing effective data collection and recording, organizational, collaborative and synthetic skills that combine your understanding of what you see with what you have learned from prior biology courses. The A-student will be able to provide credible arguments that causally link disparate physical and chemical processes at different scales to biological effects at the level of the organism or of ecology.

## Important Dates

June 16	Balance of payment due to Dept. of Integrative Biology for field course registration
June 23	Draft independent research project proposal due (submit via DropBox in CourseLink)
July 29	Arrival at St. John NB airport (or independent arrival at Huntsman marine labs)
July 30	Field course starts
Aug. 5	Group project reports due (submit via DropBox in CourseLink)

Aug. 9	(Evening) One minute oral progress report on independent research project
Aug. 11	Clean up day; Field note book assessment
Aug. 12	Depart Huntsman marine lab
Sept. 15	(Afternoon) Three minute thesis oral presentation to group at Guelph (off-campus students will participate through Skype/FaceTime).
Sept. 29	Independent project reports due (submit via DropBox in CourseLink)

**Course Expectations** *'Live each day as if it is your last, learn as if you'll live forever.'* M. Ghandi

This is an immersive field biology experience and students are expected to participate in all aspects of the course and to work collaboratively, as necessary even after hours. Students who do not sufficiently engage with the course may be asked to leave (at their expense).

Days will frequently start before 6 AM and end after 11PM. Expect to work very hard while on course to complete all of the work.

Field work will be carried out regardless of outside weather conditions (except in the case of extreme weather). Be prepared in the field with appropriate clothing to stay dry, warm and hydrated.

Effective data collection and observations in the field is difficult but necessary. Always bring and USE your field book to record observations that you will need for writing reports. Take photographs with your cellphone to help remember local conditions.

Intertidal shoreline excursions: Be prepared for mud in sediment dominated habitats (bring boots). On rocky shorelines, be prepared for extremely slippery surfaces and wave surges. Mixed rocky and sediment shorelines will have both challenges.

Falling on a rocky shoreline risks cuts especially to hands (gloves can be useful and sturdy pants are recommended). Be aware of others (to help) and do not wander off alone.

Boat excursions: Be prepared for ocean swell that can cause nausea. Boat decks are frequently wet, slippery and can move requiring attentiveness. Benthic trawls involve heavy machinery run by the deck crew. Be aware of what is going on around you, stay out of the way of the machinery and obey all crew commands.

Huntsman marine lab rules will be provided on arrival. Students are expected to abide by these.

You will be collecting animals both for general use and for your particular use in your research. You will treat all animals (whether yours or others) with care:

- Animals for general AND your specific research use will be returned to the Huntsman lab where you will help with arranging their housing under instructor supervision.
- Animals for your specific research use must also be cared for by you during the period of use (including monitoring water conditions, feeding, removal and disposal of dead or dying animals, etc.). You are responsible for your animals. Please consult with instructors if uncertain.

We will use a variety of standard sampling methods to collect organisms. Note that not all marine habitats are easy to sample. Depending on circumstances, some methods unavoidably result in animal by-catch and even death (especially benthic trawling).

## **Use of Animals**

The University of Guelph is committed to principles of conducting research and teaching in accord with the highest ethical standards. Given that 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 to ensuring that animals which are used will 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 Animal Care Policy and Procedures (<http://www.uoguelph.ca/research/for-researchers/ethics-and-regulatory-compliance/animals>). On course, students will be expected to bring a high standard of care for collected animals

Course Expectations

## Course and University Policies

### Grading

**All assignments and papers are due on the dates noted above. Late penalty is 20% per day, including weekends.**

### 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, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

**Consideration may be granted at the instructors discretion. Please note that consideration for medical, compassionate or university-related conflicts (e.g., varsity sports) may require additional discussion with your program counsellor. Consideration is generally more likely when the student proactively advises the instructor of issues well in advance of deadlines.**

### Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services - SAS (formerly: Centre for Students with Disabilities - CSD) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.uoguelph.ca/csd/>

### 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 advisort.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

### E-mail Communication

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

### Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40<sup>th</sup> class day (Nov. 3, 2017). To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

### 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.

### 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.

### **Campus Resources**

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

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

- make an appointment with a program counsellor in your degree program.  
<http://www.bsc.uoguelph.ca/index.shtml> or <https://www.uoguelph.ca/uaic/programcounsellors>

### If you are struggling to succeed academically:

- 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. <http://www.learningcommons.uoguelph.ca/>

### 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.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention.  
<https://www.uoguelph.ca/studenthealthservices/clinic>
- 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. <http://www.uoguelph.ca/~ksomers/>

### If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how

to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/csd/>