



IBIO*4600 Integrative Marine and Freshwater Research

Fall 2020

Section(s): 01

Department of Integrative Biology

Credit Weight: 1.00

Version 1.00 - July 13, 2020

1 Course Details

1.1 Calendar Description

In this course, students will integrate theory and analytical methods to address common problems in marine and freshwater biology. Particular emphasis will be placed on the process of inquiry including: development of research problems, data retrieval from existing literature, design and interpretation of experiments, sampling, statistical inference, and written and oral presentation.

Pre-Requisites: BIOL*3450, (STAT*2040 or STAT*2230), (ZOO*3210 or ZOO*3610)

Restrictions: Restricted to students in BSCH.MFB.

1.2 Course Description

This capstone course in Marine and Freshwater *Research* emphasizes hands-on learning and the application of concepts taught throughout the Marine and Freshwater major. The overall objectives of the course are twofold: (i) provide every MFB student with the opportunity to conduct independent, mentor facilitated research, and; (ii) further develop critical skills/techniques that will aid students in pursuit of careers related to their broad training in the aquatic sciences. The research portion of this course allows students to develop and pursue an independent scientific question of their interest. Emphasis in this half of the course will be placed on the development of research problems/hypotheses/predictions, placement of research within existing literature, data retrieval and synthesis from existing literature (i.e., meta-analysis), design and interpretation of experiments, sampling, statistical inference, and finally scientific communication (i.e., written and oral presentations). This type of problem-solving in group settings is a must for any future application of the MFB degree in industry, academia or government. Finally, in order to hone the necessary skills and perspective for a career in marine and freshwater science, workshops will be given to help steer the students in all aspects of research and its application. This latter aspect of the course includes modules

(for example: animal husbandry, data analysis, and field sampling techniques), discussion groups, and seminars addressing potential career options. All students that are MFB majors will be expected to take this course. This is a draft course outline and is subject to change up to the first day of classes, in keeping with the policy described in the University of Guelph Academic Calendar.

1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

1.4 Final Exam

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

2 Instructional Support

This course includes significant time framing a research problem and applying this research problem within the Hagen Aqualab or in a relevant ecosystem. This course includes research and lab support.

2.1 Instructional Support Team

Instructor:	Kevin McCann
Email:	ksmccann@uoguelph.ca
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Lab Co-ordinator:	Matt Cornish
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3 Learning Resources

This course requires no books, as the professor and teaching assistant act as guides/mentors overlooking each group research project. Nonetheless, the following suggested books are helpful.

Northey, M. and Aderkas, P.V. 2011. Making sense: A student's guide to research and writing.

Ruxton, G.D. and Colegrave, N. 2003. Experimental design for the life sciences.

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. **The overall learning outcome this course offers is the ability for students to begin to understand how to use their undergraduate training to navigate complex real world research problems rooted in aquatic biology. Specifically a student completing this course will be able to:**

Learning outcomes:

- Apply critical thinking, analysis, and inquiry skills to challenges related to aquatic
- Develop a research idea (based upon the integration of scientific literature, preliminary observations, and challenges arising during the experiment) into a defensible proposal and project.
- Quantitatively synthesize relevant scientific literature and perform statistics.
- Understand and apply techniques used in aquatic/marine science (i.e. animal husbandry).
- Synthesize knowledge and effectively communicate (in both written and oral forms) research findings to peers and potential stakeholders within the field of aquatic sciences.
- Develop the skills to work with others effectively towards a common goal.

5 Teaching and Learning Activities

Activities and Format

The capstone course consists of the following two components: i) workshops, and; ii) group research projects.

Workshops: Students, TA and instructor will meet on a weekly basis. These meetings are used to guide the students in scientific methods as well as generally explore the role of the biological sciences in society. Short lectures give students the tools they need to conduct their research, perform literature research, discuss and integrate concepts, evaluate work by their peers, keep a laboratory/field notebook, present their work orally and in writing and work successfully in small groups. Hence, lectures include but are not limited to the scientific method, experimental design, statistical analysis and software, use of public databases, writing scientific papers, giving oral presentations, peer review, techniques in meta-analysis, and methods for problem-solving of the scientist. Lab modules will be held in conjunction with materials covered in class meetings and lectures. Once the research projects are underway these lab periods are utilized to teach methods that students will need to successfully complete their projects as well as selected methods that are an essential tool kit

for a student graduating from a marine and freshwater program. These techniques include but are not limited to statistical analysis, water chemistry, sampling methodologies in aquatic ecosystems, and analyses of experimental datasets.

Research Project: The research project will help to implement all learning objectives of this course (see above). While proposal development, proposal submission and data collection will be completed as a group, report writing (literature review meta-analysis and final research), and presentations will be completed individually. Literature review and final paper presentations will, however, be a coordinated presentation among group members (explanation of format will be given). Each research group will consist of four individuals. A peer review system will be used to critically evaluate the work of peers. The research component also involves the preparation and evaluation of a lab/field notebook.

6 Assessments

Students are assessed for both their participation and development of a research project within a research group. Note that while you work in a group, most written and oral assessments are done individually.

6.1 Assignments and Marking

Assignment	Grade Percentage
Research Proposal	15%
Literature/Data Review	20%
Written Course Reflection	5%

Research conduct / Group Effort 5%

Oral Presentation 20%

Final Paper 35%

7 Department of Integrative Biology Statements

7.1 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](#)

7.2 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. <http://www.learningcommons.uoguelph.ca/>
- 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: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

7.3 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. <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.selfregulationskills.ca/>

7.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar.
(<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

8 University Statements

8.1 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.

8.2 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 grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of

Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

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

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

8.4 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.

8.5 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.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

8.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct

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

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

8.7 Recording of Materials

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

8.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
