Department of Integrative Biology, University of Guelph

BIOL*4350 LIMNOLOGY OF NATURAL AND POLLUTED WATERS

COURSE OUTLINE

Fall 2017 (F17)

TEACHING TEAM

Professor: Dr. J.D. Ackerman, 2468 Science Complex, ×58268, ackerman@uoguelph.ca
Instructor: Sheri Hincks, 3509 Science Complex, ×56010, shincks@uoguelph.ca
Teaching Assistant: Karalea Cantera, kcantera@uoguelph.ca

COURSE SCHEDULE

Lectures: 11:30-12:50 Tues. and Thurs. MCKN, Room 223
Labs: 14:30-17:20 Mon or Tues, SCIE 2305

COURSE DESCRIPTION

This course will familiarize students with the characteristics and methods of study of the limnology of natural and polluted aquatic ecosystems. The laboratory includes methods of biological, chemical and physical assessment such as field surveys of algal, macrophyte and benthic invertebrate diversity, toxicity assays, and analyses of stream flow.
Credit: 0.5
Prerequisite: BIOL*3450 Introduction to Aquatic Environments

Responsibilities: 1) Student: - Open mind / willing to discuss and exchange views and to participate
- No electronic connections / recording
- Academic integrity/offence (see U of G Calendar)
2) Professor: - Responsive to students
- Fair and equitable

Problems: See me or have me recommend someone for you to see.

LEARNING OUTCOMES

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

1. Understand discuss the physical and chemical properties of water in freshwater streams and lakes.
2. Recognize and discuss the environmental impacts upon ecologically diverse systems: headwater streams; floodplain rivers; shallow waters including wetlands; profundal zones; lakes; and dispersion in rivers.
3. Describe and discuss the environmental impact of nutrient additions; acid rain; hypoxia and invasive species.

4. Explain the environmental impacts of fisheries.
5. Apply approaches and tools to analyze/mediate issues related to water pollution in freshwater.
6. Develop skills in physical and chemical measurement techniques for various freshwater aquatic habitats including lentic, lotic habitats and toxicity testing.
7. Formulate research questions by practicing the process of biological inquiry using the scientific method including testing predictions of falsifiable hypotheses.
8. Prepare and communicate scientific ideas, including scientific writing and oral communication

COURSE RESOURCES

Required Textbook

Moss, B.R. 2010. Ecology of Fresh Waters 4th Ed. Wiley-Blackwell. 480 pp

Lab Manuals

There are two required lab manuals for this course which must be purchased prior to the beginning of Lab 1. Details will be made available on courselink.

(1) *Limnology of Natural and Polluted Waters* 2017. Dept. Integrative Biology, U. of Guelph
(2) *Identification keys for life along the Speed River Watershed*. Dept. Integrative Biology, U. of Guelph

Lab equipment:

Students will be responsible for providing their own lab coats, dissection instruments, rulers, pencils, and laboratory notebooks.

Courselink

This course will make use of the University of Guelph's course website on D2L (via Courselink). You are responsible for **all** information posted on the Courselink page for BIOL*4350.

Links to additional required readings will be posted on CourseLink.

PDFs of Lecture Presentations will be posted on Courselink prior to each lecture. Please check for any revisions to the PDF files (indicated by "-R.pdf), which may be posted after the lecture.

Undergraduate Calendar

This is the source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs. It can be found at Undergraduate Calendar

COURSE STRUCTURE

The course is divided into twelve weeks, with two lectures and one lab period per week.

Week	Date (week of)	Lecture Topic *	Text Chapter	Lab Topic
	Sep 4	L1 – An Introduction to Natural and Polluted Waters	1	NO LAB
1	Sep 11	L2 – Hydrology and Light L3 – Physical-Chemical Properties of Water	2,5 3,4	Lab 1: Introduction
2	Sep 18	L4 – Sinks and Sources of Oxygen L5 – Evolution and Diversity of Freshwater Organisms	3 6	** Lab 2: Lake Assessment – *Field trip I*
3	Sep 25	L6 – Environmental Impact Assessment L7 – Headwater Streams	N/A 7	Lab 3: Lake Assessment – *Laboratory Analyses*
4	Oct 2	L8 – Headwater Streams – Environmental Impacts L9 – Statistical Analysis I – Univariate Statistics	8 N/A	** Lab 4: Bioassessment - *Field trip II* Lotic environment study.
5	Oct 9 Thanksgiving study break	Thanksgiving L10 – Floodplain Rivers	 9	NO LABS THIS WEEK **Guelph Lake Report due at noon: Friday, Oct. 13th**
6	Oct 16	L11 – Floodplain Rivers – Environmental Impacts **Midterm Lecture Exam Oct. 19**	10	** Lab 5: Bioassessment - *Field trip III* Lotic environment study.
7	Oct 23	L12 – Statistical Analysis II – Spatial and Temporal Analysis L13 – Lakes – Shallow Waters (wetlands)	10 11,12	Lab 6: Acute Lethal Toxicity Conduct experiments on Daphnia. *Experiments run Monday to Friday* **Chemical / Physical Data Analysis due at noon: Wednesday, Oct. 25th**
8	Oct 30	L14 – Lakes – Pelagic Zones L15 – Lakes – Profundal Zones	13 14	Lab 7: Macroinvertebrate ID *upstream site*
9	Nov 6	L16 – Hypothesis Formulation and Testing	11 15	Lab 8: Macroinvertebrate ID *downstream site*.

		L17 –Environmental Impacts of Fisheries		**Toxicity Report due at noon: Wednesday, Nov.8th**
10	Nov 13	L18 –Environmental Impacts of Nutrients Additions L19 – Intermittent Stratification in the Western Lake Erie	15 N/A	Lab 9: Water Quality Techniques / Complete Lab Analyses **Biological Metrics Analyses due at noon: Wednesday, Nov. 15th**
11	Nov 20	L20 – Aquatic invasive species L21 – Conservation & Management of Freshwater Species at Risk	N/A N/A	** Lab 10: Tour of Guelph Water Pollution Control Plant **Stream Assessment Report due at noon: Wednesday , Nov. 22nd**
12	Nov 27	L22 – Nutrient Management L23 - Replaces Fall Study Break (Tuesday Oct. 11th)	N/A N/A	NO LAB

* Subject to change

** We will be in the field the weeks of Sept. 18, October 2 and October 16, November 20. These labs will take place outside of the Science Complex at various aquatic sampling locations and the Guelph Sewage treatment plant. Students must dress appropriately and must review the field safety protocols outlined in the lab manual before engaging in these activities. Always bring lab manual, pencils and a notebook (If you have waders please bring them when we are sampling the streams)! Other details will be provided on courselink.

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.** Students will be held responsible for all materials given in lectures, laboratory classes, and as specific reading assignments unless otherwise stated. No unofficial deferments of any scheduled evaluation will be given. Students who miss the midterm or other assessment components for documented medical or other legitimate reasons will have their final marks pro-rated on the basis of completed evaluations. No make-up evaluations will be conducted and all other reports and the final exam must be completed in order to pass the course.

EVALUATION

Assessments	Weight	Due Date	Learning Outcomes Addressed
Lake Assessment Report	**10 %**	October 13thth (11:59 AM)	5,6,7,8
Midterm Exam	**25 %**	Oct. 19th (in class)	1,2,3,4,5
Toxicity Report	**10 %**	Nov. 8th (11:59 AM)	5,6,7,8
Stream Assessment Report	**25 %**	Oct. 25 Chemical / Physical Data (11:59 AM) Nov. 15 Biological Metrics Analyses (11:59 AM) Nov. 22 Final Group report (11:59 AM) Nov. 22 INDIVIDUAL Introduction and Discussion (11:59 AM)	5,6,7,8
Final Exam	**30 %**	Dec. 4 (7:00 – 9:00 pm)	1,2,3,4,5
Total Marks	**100%**		

Lab attendance is mandatory. If you miss a lab you will not be able to submit a report.

Assessment standards for this course follow the definitions given in the 2017-2018 Undergraduate Calendar

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 in the field and will include observations, data sheets, drawings, questions, insights, ponderings, and aha moments. It will serve as an invaluable study tool while you are writing your reports and studying for exams. Your lab notebook will NOT be graded.

Lab Reports

The lab reports will consist of a formal write-up of various activities. For all reports, follow the instructions in the laboratory manual. The reports will be graded very strictly for format according to that used by *Limnology and Oceanography* (L&O). All lab reports will be submitted to the Dropbox on Courselink. See the lab manual and CourseLink for details. More details about these assignments will be provided in lecture and in lab.

Guelph Lake Report (worth 10 %)

Students will prepare a scientific report following standards of *L&O* on the results of field sampling and lab analyses of lake data. Assignment will be submitted from each TEAM (3 per group) of students. The report itself must not exceed ten pages of text (typed, double-spaced).

Toxicity Report (worth 10 %)

Acute Lethal Toxicity report following standards of *L&O* on the results of the toxicity study is required from each TEAM (3 per group) of students. The report itself must not exceed ten pages of text (typed, double-spaced).

Stream Assessment Report (worth 25 % = 10% group work + 15% individual contribution).

A Rapid Bioassessment Protocol evaluation of a stream. Teams are required to submit ongoing data collection to the Dropbox by the dates listed above. A final scientific report following standards of *L&O* on the results of the RBP bioassessment protocol evaluation is required from each TEAM (3 per group) of students. The report must not exceed fifteen pages of text (typed, double-spaced). The report (minus the Introduction and Discussion components) is due on the date listed above. The Introduction and Discussion of the report will be submitted **as an individual contribution**, which is due on the date listed above.

Midterm Exam

This exam will cover lecture content only and will take place during the lecture period. The test will include all the material presented in class up to the preceding lecture period. The exam may consist of multiple choice, short answer type or long answer questions. Synthesis of concepts, rather than straight regurgitation of facts will be emphasized. **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. If approved, final marks will be pro-rated on the basis of completed evaluations

Final Exam:

This exam will be written during the final exam period and will cover all of the content covered in the course. The exam may consist of multiple choice questions, short answer, and longer essay questions. You will be assessed on your ability to evaluate the information and interpret it in light of the studies you have examined in the lecture. 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.

IMPORTANT DATES

Date	Event	Time / Location
Sep 7	First lecture	MCKN 223 (lecture)
Sep 11/12	First labs	SSC 2305 (lab)
Sep 15	Add period ends	Friday
Sep 18/19	Field Trip- Guelph Lake	Meet in lab
Oct 2	Field Trip - Stream	Meet in lab
Oct 9	Thanksgiving	NO CLASSES - NO LABS THIS WEEK
Oct 10	Fall study break	NO CLASSES
Oct. 13	**Lake Assessment Report Due**	ONLINE by 11:59 AM
Oct 16	Field Trip- Stream	Meet in Lab
Oct 19	**Midterm lecture exam**	in class – ALEX 100
Oct 25	**Chemical Physical Data Analysis Due**	ONLINE by 11:59 AM
Nov 3	40th class day	last day to drop 1-semester courses
Nov 8	**Toxicity Report Due**	ONLINE by 11:59 AM
Nov 15	**Biological Metrics Analysis due**	ONLINE by 11:59 AM
Nov 20/21	Field Trip- Sewage treatment Plant	Meet in lab
Nov 22	**Stream Assessment Report Due (GROUP AND INDIVIDUAL)**	ONLINE by 11:59 AM
Nov 30	Last lecture (replaces fall study break days)	MCKN 223
Dec 4	**Final exam**	7:00-9:00 pm TBA

COURSE AND UNIVERSITY POLICIES

Late Policy

Late lab assignments are not accepted without prior arrangement with Dr. Ackerman or Sheri Hincks. Work that is handed in late will be penalized 10% **each day** that it is late.

It is incumbent on the student to inform the instructors of the course within the first two weeks of class if there is a conflict between a student's religious observations (Holy Days) and a scheduled lab component, or lecture / lab evaluations.

Appropriate Use of Conferences

This course has been designed to foster interaction between students, student teams and with the instructors. The conferences (Discussions in Courselink) provide a means for team members to share

ideas, opinions, and resources. The use of these computer conferences is a privilege, not a right, which may be revoked at any time for abusive conduct. Please show respect for the opinions of others at all times, even if you do not agree with their ideas. We encourage you to disagree, critique and add new insights, but this must be done in a positive manner. Discussions in the online conferences must be treated the same as face-to-face discussions. In the conferences others cannot see such things as facial expression and body language, both of which we normally take into account when talking face-to-face with someone. Therefore, be very careful in the phrasing of your contributions and responses, as they may be interpreted differently than what you had intended. Please respect your fellow students. You MUST NOT post racist, sexist, homophobic, or other similar remarks that are likely to cause offence. Please keep in mind that the conferences are public places. Anyone with access to the course website has the capability of seeing conference postings.

When you cannot meet a course requirement

If you are absent from classes and/or labs during the semester, you will be expected to make up missed lecture and laboratory material on your own.

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing or by email and include your name, ID#, email contact and supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic Consideration. Academic Consideration 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.

Use of Animals

The University 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 http://www.uoguelph.ca/research/assets/acs/docs/university_animal_care_policy_and_procedures.pdf

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 Student Accessibility Services (formerly the Centre for Students with Disabilities) as soon as

possible. For more information, contact Student Accessibility Services at 519-824-4120 ext. 56208 or email csd@uoguelph.ca.

Academic Integrity

Although we do encourage you to share thoughts and ideas while studying for the course, all material submitted for grading MUST BE YOUR OWN work (unless otherwise stated in the assignment instructions). The University takes a serious view of academic misconduct, including plagiarism. The penalties for academic misconduct are severe and can lead to expulsion from the University and the revocation/rescinding of a degree.

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.

Note: the software tool **Turnitin**, which is incorporated into the Courselink Dropbox, may be used to evaluate written submissions to detect plagiarism and copying of other students' work. Students are encouraged to use this tool to check their own assignments to ensure that they are free of plagiarised material before they submit the assignment for marking.

> **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.
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> The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Email communication

As per university regulations, all students are required to check their <uoguelph.ca> email account regularly: email 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 40th class day. To confirm the date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar.

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

Recording of presentations made in relation to course work—including lectures—is strictly prohibited without the permission of the presenter, whether the instructor, a classmate or a guest lecturer. Material recorded with permission is restricted to use for that course by the person who was authorized to make the recording unless further permission is granted.

Missed lectures

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

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

Make an appointment with a Program Counsellor in your degree program.

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.

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

Student Accessibility Services (SAS) formerly Centre for Students with Disabilities 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.