

BIOL 335
Limnology and Aquatic Ecology
Fall Term (2024)

CALENDAR DESCRIPTION

Physics, chemistry and biology of freshwater lakes. Emphasis on: morphometry; light and temperature; water chemistry in relation to nutrients; physiological requirements; composition and interaction of algal and invertebrate populations; eutrophication; pollution; environmental change.

NOTE Field trip: estimate cost \$70.

Requirements: Prerequisite CHEM 112/6.0. Recommended BIOL 200/3.0 or BIOL 201/3.0* or BIOL 202/3.0*.

Limnology and Aquatic Ecology:

Limnology is a diverse subject that covers geological, physical, and chemical aspects of inland waters (lakes, rivers, streams, wetlands, etc.) and their associated ecosystems. In a 3-unit course we cannot attempt to examine all facets of the integrative and transdisciplinary subject of limnology. Although inland waters represent only a small fraction of the water on Earth, they play a pivotal and essential role in our lives.

Learning Objectives:

Limnology, the study of inland waters, is an inherently interdisciplinary subject. The overall goal of this course is to provide you with a basic understanding of the physical, chemical, and biological processes in lakes, as well as an appreciation of the impact of human activities on these waterbodies, and solutions to pressing problems in aquatic ecology.

More specifically the Learning Outcomes of this course include being able to:

- 1) Analyze and interpret chemical and biological data collected using limnological techniques to improve skills drawing valid conclusions from complex data sets.
- 2) Apply limnological concepts and critical thinking to demonstrate an integrated understanding of the roles of physical, chemical and biological characteristics and processes in structuring aquatic communities (at all trophic levels from microbes to fish), in Arctic, temperate and tropical systems.
- 3) Appraise, logically predict, and clearly communicate the impact of a variety of human activities (e.g. watershed disturbances, mining, industrial activities) on ecosystems and environmental health, and formulate appropriate remediation techniques.
- 4) Conduct, analyze, and interpret the laboratory exercises to gain understanding of limnological concepts, and gain experience in the writing of clear, concise and integrated reports.

5) Explain and effectively communicate how basic principles and concepts associated with the physical, chemical, and biological -aspects of limnology can be applied to understand lake ecosystems.

6) Understand, recognize, and describe contributions from the disciplines of physics, chemistry, biology, geography, environmental studies and engineering to develop an overarching understanding of limnological systems.

Structure of Course:

This course is organized using a 12-week schedule. Each week contains all the required resources including readings, copies of the lectures and associated links. Also in each week are links to all the activities and assessments you are to complete as part of this course.

In teaching this course, I adapt the approach used in most standard texts, starting with the importance of physical characteristics of lakes and their interaction with light, heat, and geographic location (**Part I of the course Physical Limnology**), followed by the importance of chemistry and limiting nutrients (**Part II the course, Chemical Limnology**). This simplification allows insights into the complexities of physics and chemistry that are fundamentally linked biology and biological change over time (**Part III of the course, Aquatic Ecology**). In the final part of the course, I will use several integrative examples to show how lakes are impacted by both natural and anthropogenic activities, and why an understanding of environmental and ecological change is important to maintain biodiversity and ecosystem services of inland waters (**Part IV of the course, Integrative Limnology**).

Course material will be presented using three approaches: formal lectures, laboratories, and a compulsory field trip to the Queen's University Biology Station on Lake Opinicon (one day; either Saturday, September 28 or Sunday, September 29). Although there is some overlap in the material that will be presented using these approaches, they and the associated reports and exams serve to reinforce the important concepts related to the learning outcomes of this course.

Labs: Total of 4 labs + a one-day compulsory fieldtrip. Always come prepared for the labs (i.e., read and understand the PDF that has been posted for the lab). Attendance at the labs is compulsory. You signed up for a lab at one of the following three times: Monday, 14:30-17:30; Wednesday, 11:30-14:30; or Thursday, 14:30 to 17:30. All labs are held in Rm. 3320 of the Biosciences Complex. Please show up to your assigned lab in the 2nd week of classes for an introduction to the labs, safety information, and to be divided into sections for the Monday and Wednesday labs (there is only one section for the Tuesday lab). We will also collect your preferences for the day of your fieldtrip.

Fieldtrip: In this course we have a compulsory one-day fieldtrip to the Queen's University Biology Station (QUBS) (Saturday, September 28 or Sunday, September 29). The bus will arrive on Barrie St. at the north end of the Biosciences Complex by 7:20 am. We will leave

at 7:30 sharp and will return by approximately 6 pm the same day. As indicated in the calendar description for this course, the cost of the field trip will be \$70. This cost will cover the cost of transportation to and from the Biology Field Station, user fees, and lunch. Please contact me if there is an issue with the cost of the trip. The fieldtrip will occur rain or shine, so if you don't have a raincoat or boots, please feel free to contact the Queen's Outdoor Field Experience Initiative run by biology graduate students (<http://www.qofei.com>).

There is a strong practical component to this course beginning with the field trip where you will receive an introduction to physical, chemical, and biological sampling techniques, and activities involving the identification of living plankton and invertebrates. Preserved specimens will be collected for use in our labs, but experience of sampling and identifying live organisms cannot be recreated in the lab, so attending the one-day fieldtrip is important. The material covered on the field trip will also form part of the Lab Exam.

Important Dates:

The fall term starts on Tuesday, September 3rd, so our first class will be on Wednesday, September 4th @ 8:30 in Dunning Hall, room 27.

September 16th - Last date to drop Fall Term classes without penalty.

September 28 or 29 - Field trip to the Queen's University Field Station (QUBS) on Lake Opinicon. As mentioned above, you will participate in four hands-on modules, that alternate between on lake, and off lake activities.

September 30 - National Day for Truth and Reconciliation - all academic activities are suspended)

October 1 - Teaching Day Change - To Monday Programming - necessary to balance the number of teaching days in the term.

October 7 - BIOL335 Midterm (in class)

November 25 - Lab exam (rm. 3220 Bioscience Complex) - If you have a scheduled Monday lab, this exam will be at 2:30. If your lab is on Wednesday or Thursday, the lab exam will be at 9:30 am (your normally scheduled lecture time on Monday) but in rm 3320 Bioscience Complex. This exam will assess your knowledge of the material covered in the labs and on the field trip and will occur in the limnology lab (rm. 3320 Biosciences).

Final exam - will be scheduled by the exams office following the fall-term pre-examination study period (December 4-6).

For other important university dates during the fall term, please visit the Faculty of Arts and Sciences webpage [SessionalDates 2024 25 ASC.pdf \(queensu.ca\)](#).

Course Materials (Textbooks/Reading):

The textbook for this course Wetzel's Limnology: Lake and River Ecosystems (2023) - this text is available as an ebook from the Queen's Library ([Wetzel's Limnology | ScienceDirect \(queensu.ca\)](http://www.queensu.ca)). This is an updated version of the classic limnology text by Wetzel (2021) - *Limnology: Lake and River Ecosystems* (3rd edition). This is a comprehensive account of limnology, and a great reference. Please note that there are summaries of the important points of each chapter at the end of each chapter.

I will also post several scientific journal articles relevant to the material presented in the course will be linked to the library via the BIOL335 OnQ website.

Course Assessment:

Component	Weight (%)
Assignment 1 (Lab 1): Lake Models and thermal stratification; your assignment is due 10 days following your lab.	10%
Midterm exam - covers lecture material up to the end of the physical and chemical limnology sections of this course, held in class. This exam has been schedule on the Monday prior to your fall break.	20%
Assignment 2 (Lab 3): Assessment of long-term change in aquatic systems; your assignment is due 10 days following your lab.	15%
Lab Exam (covers material covered in lab and the fieldtrip)	15%
Final Exam (written in the exam period. The goal of the exam is to give you the opportunity to show that you can integrate and apply the information learned in this course.	40%

One of the skills you are expected to master during your university education is to communicate clearly and logically the knowledge that you have gained. Two written assignments are part of this course (Lab 1 and Lab 3). As 25% of your final mark will be dependent on them, you should spend considerable time in preparing concise, clear, and correct reports. The format of the papers will be detailed in your lab. Your reports will be due 10 days following your lab. Each assignment will have an automatic three-day grace period. As such, short-term academic considerations are built into the assignments. Submission of assignments after the grace period will be 10% per day.

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale.

Academic Integrity:

Queen's students, faculty, administrators and staff therefore all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see <http://www.academicintegrity.org>) and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic

community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University. Students are responsible for familiarizing themselves with and adhering to the regulations concerning academic integrity. General information on academic integrity is available at [Academic Integrity @ Queen's University](#), along with Faculty or School specific information.

Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery, and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university. Please see section below entitled 'Academic Integrity' for more details.

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Please see section below entitled 'About Turnitin at Queen's' for details the terms of service of between Queen's and Turnitin, which includes how you exercise control over cookies used by this program.

Academic Accommodations and Considerations:

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodation, you are strongly encouraged to contact Queen's **Student Accessibility Services (QSAS)** and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: <http://www.queensu.ca/studentwellness/accessibility-services/>. Typical accommodations may include extra time on assessments and/or special room requirements. Queen's is now using a new system, called Ventus, which allows instructors to be aware of accommodations. Please follow up with me if you have an accommodation and we are not meeting your obligations.

Academic Consideration is mitigation for a short-term issue related to an extenuating circumstance. There are 2 types of academic considerations. The first is called a 'brief absence' (up to 48hrs) and is essentially a self-declaration of an extenuating circumstance. The second is a short-term extenuating circumstance that can be from 2 days-3 months (and requires documentation). For information on submitting an consideration please see: <https://www.queensu.ca/studentwellness/forms>. This form must be used if you are requesting an academic consideration.

Communication:

The university communicates with students via Queen's email. Please check your email regularly to ensure you do not miss important information related to your course.

Questions about your labs (and the associated assignments) should be directed to your Teaching Assistant. Normally, your TA will be available in your regularly scheduled lab slot.

Any reoccurring questions or concerns that we learn of will be addressed on the OnQ page for this course as a course announcement.

For any questions on the lecture components of this course, please feel free to contact me before/after lecture, or during the regularly scheduled office hours on Friday (9 to 10 am, Rm 3110). If this time is not possible, please email.

Netiquette

In any course you often communicate with your peers and teaching team through electronic communication. You are expected to use the utmost respect in your dealings with your colleagues or when participating in activities, discussions, and online communication.

Here is a list of netiquette guidelines. Please read them carefully and use them to guide your communication in this course and beyond.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's ok to disagree with ideas, but do not make personal attacks.
7. Be open to being challenged or confronted on your ideas and to challenging others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

Copyright:

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor's course materials or to provide an instructor's course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor's **express consent**. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.