

# BIOL 335

## Limnology and Aquatic Ecology

Fall Term (2021-22)

### CALENDAR DESCRIPTION

Physical, chemical and biological aspects of freshwater lakes. Emphasis on: morphometry; light and temperature; water chemistry; ecological and physiological requirements; composition and interaction of algal and invertebrate populations; fish interactions; eutrophication; acid rain; other forms of pollution; climatic and other environmental change.

RECOMMENDATION BIOL 201/3.0 and BIOL 202/3.0 are highly recommended. PREREQUISITE CHEM 112/6.0

### SCHEDULE

**Lectures: Tuesday 8:30-9:30; Wednesday 10:30-11:30; Friday 9:30-10:30 Dupuis 215.**

**Labs: See SOLUS for a list of various lab times. BIOSCI.**

<b>Instructor</b>	Dr. J. Smol
<b>Instructor Contact</b>	<a href="mailto:smolj@queensu.ca">smolj@queensu.ca</a> Phone: 613-533-6147
<b>Office Hours</b>	After class or by appointment
<b>TA:</b>	onQ
<b>TA Contact Information</b>	onQ
<b>Office Hours</b>	By appointment

### Learning Objectives

The goals of Biology 335 are to provide students with an integrated overview of lake systems, with a focus on ecological and environmental issues.

Limnology is a large subject that covers geological, physical and chemical aspects of freshwater environments, as well as their biology and development. Obviously, in a half course we cannot attempt to examine all facets of limnology in depth. Instead, we will attempt to present an overview, emphasizing fundamental interactions and processes. The objectives of this course are 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 water bodies.

### Learning Hours

<i>Teaching method</i>		<i>Average hours per week</i>	<i>Number of weeks</i>	<i>Total hours</i>
In-class hours	Lecture	3	12	36
	Seminar			
	Laboratory	3	6	18
	Tutorial			
	Practicum			
	Group learning			

	Individual instruction			
Other	Online activity			
	Off-campus activity			
	Private study			64
Total hours on task				118

### **Course Outline**

Course material will be presented using two approaches: formal lectures and laboratories. In non-pandemic years, we also had a compulsory field trip to Lake Opinicon. However, given pandemic restrictions, the fieldtrip is cancelled this year and instead we will incorporate field approaches into the lab component. Although there is some overlap between these approaches, they are not redundant and contain different information that will require your own integration.

### **Lecture Topics:**

Introduction to Limnology and Aquatic Ecology

Physical Limnology (~4 lectures: Lake morphometry; Light in lakes; Heat in lakes; Water movements)

Chemical Limnology (~ 6 lectures: Oxygen; Salinity; Carbon; Nitrogen; Phosphorus; Sulfur and Silica)

Origin of Lakes (1 lecture: Geographic aspects of limnology)

Biological Limnology (~6 lectures: Phytoplankton and primary production; Zooplankton; Fish and trophic interactions)

Integrative Limnology and Applications (~13 lectures: Paleolimnology; Acidification; Shallow lakes and alternate equilibria; Lake remediation; Saline lakes; Arctic and Antarctic lakes; Tropical lakes; Surprises in limnology; Lakes on Mars?)

### **Textbooks/Readings**

Textbook: Wetzel, R.G. 2001. *Limnology: Lake and River Ecosystems* (3<sup>rd</sup> edition), Academic Press.

A number of scientific journal articles relevant to the material presented in the course will be posted on the BIOL335 website in PDF format. Most of these papers should also be available from the Queen's library system.

## Grading Scheme

Component	Weight (%)	Date
Assignment 1: Lake Models	10%	Start of Lab 2
Assignment 2: Mesocosms	5%	Start of Lab 4
Midterm exam	20%	TBA
Assignment 2: Paleoecology	15%	Before Lab Exam
Lab Exam	10%	Week 11/12
Final Exam	40%	TBA

## **Academic Integrity and Queen's Code of Conduct**

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and conduct conform to the principles of academic integrity. Information is available in the Arts and Science Calendar (see Academic Regulation 1 - <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations>, on the Arts and Science website (see <http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity>), and at Biology's website (<http://www.queensu.ca/biology/undergrad/integrity.html>) and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulations on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

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The BIOL335 teaching team are committed to fully pursuing investigations of breaches of academic integrity. Regrettably, we have reported to the Dean several findings of academic integrity breaches in both the lab and lecture sections of this course in the past, so please be very careful to ensure you are clear on your responsibilities.

## **Accommodation Policy, Exam Conflicts, and Other Conflicts**

Students who feel they need accommodations for disabilities or extenuating circumstances, or have a conflict between exams or other commitments should consult the Biology Department's website for details about how to proceed (<http://www.queensu.ca/biology/undergrad/integrity.html>). In general, the earlier a course coordinator is apprised of an extenuating circumstance, the more likely an accommodation can be made. Students are encouraged to be proactive in anticipating difficulties, when it is possible to do so.

Students may apply to write a make-up or deferred exam if they have an exam conflict as defined in the Academic Regulations of the Faculty (See Arts and Science Calendar Regulation 8 - <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations>). In this case, the student should report to the Exams Office first to verify that there is a genuine exam conflict. Biology professors will not consider your situation to be a conflict unless it meets the criteria set out by the Faculty of Arts and Sciences.

Students may request a make-up or deferred exam if they have an exam conflict with off- campus travel associated with a field course (e.g BIOL-307/3.0 or 407/3.0) that is held during the fall or winter terms.

### **Extenuating Circumstances**

The issue of extenuating circumstances and extensions is a difficult one for both instructors and students. On the one hand, unforeseen events and critical personal circumstances arise from time to time. On the other hand, a small number of students abuse the instructor's goodwill in various ways including frequently requesting extensions for trivial reasons. The teaching team in this course is committed to being understanding and sensitive, but also responsible and firm in assessing requests for accommodations. Each request will be considered in the context of fairness to all the other students on the course. See the Biology Department's website for information about our policy and the form that you will need for missed labs and/or for large assignments or presentations:

<http://biology.queensu.ca/academics/undergraduate/prepare-yourself/>

### **Copyright**

The material on this website is copyrighted and is for the sole use of students registered in Biol 335. The material on this website may be downloaded for a registered student's personal use, but shall not be distributed or disseminated to anyone other than students registered in Biol 335. Failure to abide by these conditions is a breach of copyright, and may also constitute a breach of academic integrity under the University Senate's Academic Integrity Policy.

### **Accommodation of Disabilities**

*Queen's University is committed to achieving full accessibility for persons 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 accommodations, you are strongly encouraged to contact the Disability Services Office (DSO) and register as early as possible. For more information, including important deadlines, please visit the DSO website at: <http://www.queensu.ca/hcds/ds/>*

### **Grading Method**

In this course, most or all components will be graded using numerical percentage marks. Your course average will then be converted to a final letter grade according to Queen's Official Grade Conversion Scale:

<b>Grade</b>	<b>Numerical Course Average (Range)</b>
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below