1 Course Details

1.1 Calendar Description

In this course students will be taught how to apply quantitative methods to the analysis of aquatic systems of the earth from many simultaneous perspectives. The material will include the physical, chemical and biological components of the various liquid surficial structures and processes and also how they interact with humans. The economic, social and policy implications of humans interacting with aquatic systems will also be emphasized. The history of the analysis of aquatic systems will be systematically included in the material.

Pre-Requisites: 
10.00 credits including (BIOL*1030, BIOL*1040) or (BIOL*1070, BIOL*1090), CHEM*1040 10.00 credits including (BIOL*1030, BIOL*1040) or (BIOL*1070, BIOL*1090), CHEM*1040

Restrictions: 
BIOL*3450

1.2 Course Description

In this course students will be taught how to apply quantitative methods to the analysis of aquatic systems of the earth from many simultaneous perspectives. The material will include the physical, chemical and biological components of the various liquid surficial structures and processes and also how they interact with humans. The economic, social and policy implications of humans interacting with aquatic systems will also be emphasized. The history of the analysis of aquatic systems will be systematically included in the material.

1.3 Timetable
Lectures: Tuesdays and Thursdays, 1:00-2:20
Labs: Friday (9:30-11:20) and Friday (12:30-2:20)

1.4 Final Exam

FINAL EXAM
Friday (2022/04/21)
2:30 PM - 4:30 PM
Room TBA

2 Instructional Support

Class Schedule and Location:
Lectures:
Synchronous (virtual for first 2 weeks with possible extension; in-person thereafter)
Tuesdays & Thursdays, 1:00-2:20 pm
Labs:
Fridays (Section 0101): 9:30-11:20
Fridays (Section 0102), 12:30-2:20
Synchronous (virtual for first 2 weeks with possible extension; in-person thereafter)
Best way to contact the professors: Email
Instructor Emails: psibley@uoguelph.ca (Paul Sibley); nrooney@uoguelph.ca (Neil Rooney)
Office Hours: By appointment (virtual or in-person)
Best way to contact the TA: Email
Yaryna Kudla (ykudla@uoguelph.ca)
Notes:
- Please be sure to check Courselink for information updates on a regular basis (daily is recommended)
- Zoom links for the labs and lectures are provided in Courselink under the Zoom tab
- All synchronous lectures will be recorded for later asynchronous viewing; these will be posted to Courselink under the Recordings tab
- Internet issues are likely to arise at some point. Please be patient if this occurs. If connectivity cannot be established, that class will be cancelled and I will record the full lecture independently and post to Courselink for later viewing.

3 Learning Resources

No book is required for this course. However, Ecology of Aquatic Systems (Dobson and Frid) is a suitable instructional text for those who wish to augment their understanding of the lecture material. Additional reading material, relevant to specific case studies (lecture and labs) will be introduced throughout the course. A list of journal articles and books is provided in the course syllabus on Courselink

4 Learning Outcomes

With respect to course material:
1. To gain foundational knowledge on which to understand the basic physiography, chemistry and biology/ecology of aquatic (freshwater and marine) systems
2. To understand the science of aquatic systems in the context of management and policy principles and the essential link that must be established between these two elements in order to develop innovative and effective policies.
3. To understand 1 and 2 in the context of key global environmental issues presently facing humanity and how these issues have been or should be managed using sound science and policy.

With respect to scientific evaluation and effective communication:
4. To evaluate scientific evidence through critical evaluation of the literature and defense of ideas through discussion and debate.
5. To promote effective communication in an academic and professional environment through technical reports, discussions and debates.
6. To promote numeracy through problem solving (calculations) in lectures and statistical analysis of laboratory-generated data sets presented in laboratory report.

Note: These learning outcomes will remain the same whether teaching is in-person or virtual. However, the relative emphasis on each may change depending on which of the teaching modes is more or less emphasized as dictated by responses to the pandemic.

## 5 Teaching and Learning Activities

### 5.1 Lecture

<table>
<thead>
<tr>
<th>Date (weeks of)</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 11, 13, 18, 20 (4 lectures)</td>
<td>Introductory concepts and basic principles in water chemistry, hydrology, and physiography [Sibley]</td>
</tr>
<tr>
<td>January 25, 27 February 1, 3 (4 lectures)</td>
<td>Dead lakes and dead zones: The science and management of nutrient pollution [Rooney]</td>
</tr>
<tr>
<td>February 8, 10, 15, 17 (4 lectures)</td>
<td>When the switch goes off: Ocean acidification and the state of the world’s oceans (Note: winter break is the week of Feb 15) [Sibley]</td>
</tr>
<tr>
<td>Feb 21-25</td>
<td>Reading Week</td>
</tr>
<tr>
<td>March 1, 3, 8, 10 (4 lectures)</td>
<td>Who killed the Grand Banks? The science and management of marine &amp; freshwater fisheries [Rooney]</td>
</tr>
<tr>
<td>March 15, 17, 22, 24 (4 lectures)</td>
<td>From Ocean vents to Great Lakes Invasive Species: Concepts of Biodiversity [Rooney]</td>
</tr>
<tr>
<td>March 29, 31 April 5, 7 (4 lectures)</td>
<td>Aquatic Systems: The final repository for the by-products of Society [Sibley]</td>
</tr>
</tbody>
</table>

### 5.2 Laboratory
### Topics:

<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Lab assignment due date</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 21</td>
<td>Data analysis and report writing in 3150</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Jan 28, Feb 4</td>
<td>Nutrient Pollution</td>
<td>Friday, Feb 25</td>
<td>Scientific</td>
</tr>
<tr>
<td>Feb 11</td>
<td>Ocean Acidification</td>
<td>Mar. 4</td>
<td>Critical</td>
</tr>
<tr>
<td>Feb 18</td>
<td>Fisheries</td>
<td>Mar. 11</td>
<td>Media</td>
</tr>
<tr>
<td>Feb 25</td>
<td>Reading Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mar 4, 11</td>
<td>Biodiversity</td>
<td>Friday, Mar 25</td>
<td>Scientific</td>
</tr>
<tr>
<td>Mar 18</td>
<td>Contaminants</td>
<td>Friday, April 1 (no fooling)</td>
<td>Data (option)</td>
</tr>
</tbody>
</table>

### References:

1. Some aspects of the lab section this semester may change if in-person meetings are not possible past January 24. The most likely lab affected will be the eutrophication lab (first experiment). If it is not possible to conduct this lab, you will receive a dataset from a previous year that you can write up as a report. We will provide some video clips of a typical lab set-up for each experiment so you can understand the experimental design for each of the tests. Specific guidance on the format for writing the reports will be given ahead of each assignment. The "discussion" labs (1, 3, 4, and 5) will occur as normal and will be in-person if allowed or virtual if forced.

2. All lab assignments will be submitted via Dropbox on Courselink. **Note the specific dates for assignment submission in the table above.** All assignments are due on Fridays, in your respective labs (via DropBox).

3. Only one (1) of the two lab reports (eutrophication or biodiversity) must be written up. You are welcome to write both labs and we will take the better mark of the two as your final grade for the scientific report component. Strategically, it is recommended that you write up the first one and decide on submission of the second depending on your performance in the first one.

4. **Exams:** The mid-term is worth 20% and the final exam is worth 25%. There is more material covered in the latter half of the course which is why the final exam is weighted greater than the mid-term.
## 6 Assessments

### 6.1 Marking Schemes & Distributions

Due dates and mark proportions for the assignments are given in the table above.

### 6.2 Assessment Details

**Midterm (20%)**

**When:** Thu, Feb 17, 1:00 PM - 2:20 PM, In class

Midterm covers first half of lecture material

**Final (20%)**

**When:** Thu, Apr 21, 2:30 PM - 4:30 PM, In class

Final exam covers second half of course material (the exam is not cumulative)

**Scientific Report (20%)**

**When:** Fri, Feb 25, Dropbox

Scientific report for nutrient experiment (Dropbox)

**Critique (15%)**

**When:** Fri, Mar 4, Dropbox
The critique is associated with the ocean acidification lab and is due on the day you have your regular lab via Dropbox

**Media Report (10%)**
**When:** Fri, Mar 11, Dropbox

The media report is associated with the fisheries discussion and will be due on the day you have your regular lab via Dropbox

**Policy Brief (15%)**
**When:** Fri, Mar 25, Dropbox

The policy brief is associated with the biodiversity lab and is due in your respective labs via Dropbox

**Data Report (5%)**
**When:** Fri, Apr 1, Dropbox

This scientific (lab) report is associated with the toxicity lab and is due on April 1. **IT IS AN OPTIONAL LAB**

### 6.3 Assignment Schedule

<table>
<thead>
<tr>
<th>Assignment or Test</th>
<th>Due Date</th>
<th>Contribution to Final Mark (%)</th>
<th>Learning Outcomes Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs Assignments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient Lab (scientific report)</td>
<td>February 25</td>
<td>20%</td>
<td>1, 5, 6</td>
</tr>
<tr>
<td>Biodiversity Lab (Lab report)</td>
<td>Friday, March 25</td>
<td>20%</td>
<td>1, 5, 6</td>
</tr>
<tr>
<td>Ocean Acidification Lab (Critique)</td>
<td>March 4</td>
<td>15%</td>
<td>1, 4, 5</td>
</tr>
<tr>
<td>Fisheries Lab (Media Piece)</td>
<td>March 11</td>
<td>10%</td>
<td>2, 3, 5</td>
</tr>
<tr>
<td>Toxicity Lab (Data Report)</td>
<td>Friday, April 1</td>
<td>5% (optional and bonus)</td>
<td>4-6</td>
</tr>
<tr>
<td>Exams</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid-term</td>
<td>Thursday, February 17</td>
<td>20%</td>
<td>1-6</td>
</tr>
<tr>
<td>Final Exam</td>
<td>Thursday, April 21</td>
<td>25%</td>
<td>1-6</td>
</tr>
</tbody>
</table>

### 7 University Statements

#### 7.1 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.

#### 7.2 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

7.3 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

7.4 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.

7.5 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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

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

7.6 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

7.7 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.

7.8 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

7.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

7.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

7.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- https://news.uoguelph.ca/return-to-campusess/how-u-of-g-is-preparing-for-your-safe-return/
- https://news.uoguelph.ca/return-to-campusess/spaces/#ClassroomSpaces

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.