



University of Toronto-Scarborough  
Department of Physical and Environmental Sciences  
**EESC33 Environmental Science Field Course - Fall 2021**

ESC33 Field Course 2021.

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Teaching Assistant: **Yulong Kuai** [yulong.kuai@mail.utoronto.ca](mailto:yulong.kuai@mail.utoronto.ca)  
Lectures/Tutorials: Thursdays, 9 am –11 am using **Zoom**  
(access by using link on Quercus for each week).

Due to the pandemic, this years "**Field course**" ESC33 will be taught as a series of online lectures, with 3 in person short field trips. The course will be primarily about data-analysis of water quality parameters from lakes. Usually the class would have collected some of this data ourselves from boats, With COVID19 we cannot collect a lot of data from boats ourselves, so I am hoping we can explore the data using online tools and exploring ways to understand this data using Matlab. These are not normal times and there is a lot of uncertainty for most of us, so please reach out to me if you are having any problems.

Canada has millions of lakes. They are all different, and their dynamics and water quality vary, as does the fish they can support. We can largely classify lakes by the details of the physics of how water responds to the changing seasons. Many lakes around the world now have automated measuring systems (see for example <http://ontario2.loboviz.com/>) so there is a wealth of online data available. The goal of this class is to give you some tools so that you can quickly interpret such data and help you to classify lake behaviour.

This is a small class, so I want to run it more like a tutorial than as a classic lecture. This means I want students to be engaged and ask questions, Every week I'll start with a small lecture, then we will do an exercise using Matlab. The TA (**Yulong Kuai**) and I will talk with you in groups as we do these Matlab exercises. I will use **Zoom** to run these classes between 9-11 on Thursdays. I will post the lecture file and any Matlab exercises prior to class. I will try and record each class so that you can review it later.

Before the 2<sup>nd</sup> week of class you need to install Matlab on your own machine - it is free for students and you can get the software at <https://oneresearch.library.utoronto.ca/ic/mathworks-software---matlab-students>

### **Overview:**

- Students will learn how to analyze and interpret a series of physical and chemical parameters from lakes. Emphasis will be put on how physical processes (e.g., thermal structure of the lake, surface and internal waves, currents) affect the distribution of organisms (algae, invertebrates, fish) and biological processes in the lakes in Southern Ontario.
- A major focus of the class will be learning how to process relevant data that we collect using Excel as well as the coding language Matlab (<https://www.mathworks.com/>). You can download a copy at <https://oneresearch.library.utoronto.ca/ic/mathworks-software---matlab-students>. The codes will be described in class, and students will use this to plot class data, as well as data from other sources such as government moorings in Lake Ontario (<http://ontario2.loboviz.com/>) and Lake Erie (<http://ontario3.loboviz.com/>).

- Classes will be a mix of lectures and hands-on data analysis on your computer.
- The major piece of assessment by students will be an independent research report based on online public field data.

### Marking Scheme:

- |  |      |
|--|------|
| • Three short online quizzes                 | 15 % |
| • Assignment 1 -                             | 15 % |
| • Assignment 2 -                             | 15 % |
| • Assignment 3 -                             | 15 % |
| • Individual research presentation and paper | 40 % |

### Readings and textbook

I will post relevant papers for every class.

A really good introduction to limnology (the study of lakes) is this book - *Lakes : a very short introduction* by Professor Warwick F. Vincent. A PDF of this book is available at UofT library at <http://go.utlib.ca/cat/12013998> - you just need to be logged in through you student ID to get this university library material. If you are old fashioned like me and enjoy reading real books, you can buy it from Indigo or Amazon for less than \$10.

### Tentative Lecture & Tutorial Schedule - Subject to change:

#### 9<sup>th</sup> September – Week 1

- Short lecture on thermal stratification classification of lakes based upon paper by **Lewis (1983)**
- Student introduce themselves, and we discuss course objectives.

#### 16<sup>th</sup> September – Week 2

- Short lecture on thermal cycle from three lakes (two dimictic lakes and one polymictic)– why does this matters to oxygen levels?
- First introduction to Matlab – how do we plot lake stratification and determine depth of thermocline? How do we determine oxygen saturation?
- **Assignment 1** issued

#### 23<sup>th</sup> September – Week 3

In person field trip to Highland creek to measure water quality parameters. Meet at 9 am outside ESCB building. Learn basics of knots and mooring design. Help set up mooring to deploy in pond near campus

#### 30<sup>th</sup> September – Week 4

In person field trip to Toronto Harbour 9-12 . Students makes own way downtown on TTC,

#### 7<sup>th</sup> October – Week 5

- Short lecture on wind driven upwelling and defining the Wedderburn number. How is density determined in fresh water?
- **Tutorial work on Assignment 1**, due after fall break

Fall Break October 9<sup>th</sup> – 15<sup>th</sup>

### **21st October – Week 6**

- Short lecture on nutrients levels and light profiles.
- **Assignment 2 issued** – light profiles, temperature profiles and dissolved oxygen profiles, due following week
- **Tutorial work on Assignment 2**

### **28<sup>th</sup> October – Week 7**

Plotting data from various public data sources – understanding challenges in how different time and date conventions are used, and how to read them into Matlab.

**Assignment three issued.** Data analysis of telemetered data from Loboviz stations in Lake Erie and Lake Ontario.

### **4<sup>th</sup> November – Week 8**

- Class will be a tutorial for discussion of final presentations.
- **Tutorial work on Assignment 3**
- Tutorial – work with students on research project – students identify data sources and how to plot variables.

### **11<sup>th</sup> November – Week 9**

- Tutorial – work with students on research project – identify how to plot variables and make figures.

### **18<sup>th</sup> November – Week 10**

- Tutorial – work with students on research project – identify how figures can tell a story.

### **25<sup>th</sup> November – Week 11**

- Tutorial – work with students on research project – identify how figures can tell a story.

### **2<sup>nd</sup> December November – Week 12**

- Final 10 minute presentations from students (15 talks over 3 hours).

**Research Help:** University of Toronto Scarborough Library Staff at the UTSC Library will be happy to help you find the resources you need for your assignments, and learn the research skills you will need for success at university. Research help is available by phone, e-mail, chat, or in-person in the Library. For more information, please see the Library's Help Guide for UTSC Students:

[http://guides.library.utoronto.ca/utsc\\_help](http://guides.library.utoronto.ca/utsc_help)

Need in-depth or department specific assistance? Contact Sarah Forbes, Liaison Librarian for Physical and Environmental Sciences: <http://uoft.me/smforbes>

### **Quercus:**

Lecture and lab material will be posted on and Online Quizzes will be done through Quercus. Please check daily for updates (e.g. assignments, announcements etc.): <https://portal.utoronto.ca>

### **Academic Integrity Statement:**

Academic integrity is one of the cornerstones of the University of Toronto. It is critically and important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. According to Section B of the University of Toronto's Code of Behaviour on Academic Matters, which all students are expected to know and respect, it is an offence for students:

- to use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- to include false, misleading or concocted citations in their work.
- to obtain unauthorized assistance on any assignment.
- to provide unauthorized assistance to another student. This includes showing another student completed work.
- to submit their own work for credit in more than one course without the permission of the instructor.
- to falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- to use or possess an unauthorized aid in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values, which they protect. It is your responsibility to ensure that your work maintains academic integrity. If you have any concerns please see the instructor before a potential problem arises. Please familiarize yourself with the Code

(<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm> At the University of Toronto academic dishonesty can result in a mark of zero, a reduction in final grades, denial of privileges, a monetary fine, failure in the course, suspension, permanent record, a recalling of degrees/diplomas and certificates, or expulsion.

### **Accessibility Needs:**

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: UTSC campus AccessAbility <http://www.utsc.utoronto.ca/~ability/> or St. George Campus DisAbility [disability.services@utoronto.ca](mailto:disability.services@utoronto.ca) or <http://studentlife.utoronto.ca/accessibility>.