Physical & Environmental Sciences
UNIVERSITY OF TORONTO
S C A R B O R O U G H

FALL 2021
GRADUATE COURSE OUTLINE

Note: Due to the recent COVID-19 pandemic and U of T mandates the lecture portion of this course will be entirely online. The lectures will be synchronous and will also be recorded in case you want to listen to them again. Please be present online during the lecture hours of this course. You will receive an invite in Quercus via announcments for each lecture.

There is a lab component to this course which will be completed in person.

EES1111H Freshwater Ecology and Biomonitoring
Lecture: Monday 7pm – 9pm ONLINE synchronous. Please download lectures from Quercus.
Invitations to the lecture will be sent out via announcements. Lectures will be recorded and made available through Quercus. Please attend the lecture online….Thank you in advance for your participation.
Laboratory: 11am-2pm EV222/224
Instructor: Jan Moryk
Email: jan.moryk@utoronto.ca
Teaching Assistant: Erik Dean (erik.dean@utoronto.ca)
OFFICE HOURS: TBA with Erik Dean or Jan Moryk (not mandatory to attend)

COURSE DESCRIPTION

Freshwater Ecology & Biomonitoring introduces students to the relationships between freshwater organisms and their surrounding environment including the terrestrial components of the watershed which help shape the aquatic habitat and biological community structure. This course examines the physical, chemical, and biological factors that shape freshwater ecosystems, both lentic and lotic including head water drainage features. The course examines the influence of humans on freshwater ecosystems, with focus on urbanization. The course will also examine the concept of biological monitoring ("biomonitoring") using various organisms for detecting, measuring and assessing the significance of ecological change caused by anthropogenic stressors. Student will be exposed and made aware of various analytical techniques to test data relationships as well as the various legislation, policies and guidelines which influence biomonitoring activities and environmentally related decisions.

Through the lab portion of the course students will be provided the opportunity to experience in field monitoring techniques and in person laboratory practices. Participants will be shown benthic macroinvertebrates and will have the opportunity to learn how to identify the benthic invertebrates as well

as obtain their Ontario Benthic Biomonitoring Network (OBBN) certification if their grade meets the OBBN standards.

Students will also learn how to evaluate and classify head water drainage features (HDF's) by applying the Evaluation, Classification, and Management of Headwater Drainage Features Guidelines. As a part of this course and labs students will be asked to collect, analyze and interpret data.

COURSE OBJECTIVES

At the completion of this course students should have knowledge of:

- key freshwater ecology concepts and relationships;
- techniques and standardized protocols used to conduct freshwater environmental monitoring in Ontario;
- how environmental monitoring can be used to answer research questions, evaluate responses to an environmental stressor, and/or assess the health of the aquatic system.
- Knowledge of using basic statistical methods to analyze, interpret, and present data.
- Basic knowledge of legislation, policy, and guidelines as it relates to biomonitoring and the management, conservation, and sustainable development of the environment.

At the completion of the course, participants will be provided with the information and knowledge to:

- Presented a concise talk describing a relevant issue in freshwater ecology in Southern Ontario
- Experience understanding the scenarios under which environmental legislation, policy, and guidelines apply.
- Experience oral presentation and public speaking.
- The opportunity to obtain OBBN certification.
- The opportunity to collect benthic macro-invertebrate data as well as data related to the classification and evaluation of head water drainage features.

SCHEDULE

Week	Date (2018)	Lecture Topic	Lab Topic	Helpful Readings and Important Notes
1	13-Sep	Introduction and Biomonitoring 1 (OBBN Monitoring and program).	NO lab: enjoy the poster presentation event	- Wetzel - Ch 8 - More relevant recommended readings are in the last two slides of the lecture
2	20-Sep	Biomonitoring II (OBBN bio-assessment and Study Design)	Erik Dean Introduction, welcome, OBBN intro	OBBN manual Sections 7 to and including 7.6.3 **Last Day to Enrol in course**

3	27-Sep	Application of Biomonitoring, Study Design, hypothesis testing.	OBBN/Invertebrate identification	Dodds - Ch 7; Wetzel - Ch 3	
4	4-Oct	Threats to aquatic ecosystems	OBBN/Invertebrate identification	• Walsh et al. 2005; • Wallace et al. 2014 • Other relevant readings are in the lecture	
5	11-Oct	**Happy Thanksgiving**	**Happy Thanksgiving**	**Happy Thanksgiving**	**Happy Thanksgiving**
6	18-Oct	**Test 1: (during lecture) - 25%**	OBBN/Invertebrate identification	Dodds - Ch 6	**Quiz #1 (written during lecture) - 25%**
7	25-Oct	**OBBN Verbal Test: (written during lecture) - 15%**	OBBN/Invertebrate identification	Wetzel - Ch 5-6 and Ch 9-14 Dodds - Ch 12 – 14;	**OBBN Written Test during lecture** **Last Day to Drop Course**
8	1-Nov	Properties of water; Movement of light/heat/ chemicals in water, Aquatic chemistry….continue	**OBBN ID: (Test in Lab) – 15%**	Dodds - Ch 8-11; Wetzel Ch 15-16, 22	
9	8-Nov	Head Water Drainage Features (HDF) and Ecological Interactions	**OBBN ID Test in Lab**	**OBBN ID Test in Lab** • More relevant recommended readings are in the last two slides of the lecture	
10	15-Nov	Physiography of flowing water (Lotic Systems) and ecological interactions	Explain and Work on Assignment 1	• Dodds - Ch 19-23; • Wetzel Ch 15-16, 22	
11	22-Nov	Physiography of lakes (Lentic Systems) and ecological interactions	Group Presentations (10%)	Hilsenhoff 1987, 1988, Jones et al. 2006; Steedman 1988	**Assignment 1 due (submit during lecture) - 10%**
12	29-Nov	Aquatic Organisms: Fish Ecology and Ecosystem Function	Group Presentations (10%)		
13	6-Dec	**Quiz 2: (written during lecture) - 25%**	Group Presentations (10%)		

EVALUATION

2 Tests– 50% (2 x 25%): 10 to 20 questions (short answer, multiple choice and true and false. All application based questions)

OBBN Written Test (lectures) – 15%: 24 questions (need to get min 90% correct to be OBBN certified)

OBBN ID Test (lab) – 15% online/virtually live during the lab. 44 specimens (need to get min 40/44 correct to be OBBN certified), in past years this was done in the lab.

HDF Assignment 1 – 5%
Group Presentations – 10%
Lab online attendance - 5%
NO FINAL EXAM

Tests (2 in total)

There will be 2 tests completed in during the lecture portion of the course. The tests will encompass the lecture material (not laboratory material) covered in the lectures prior to the test but will not be comprehensive (i.e. test 2 will not cover lecture material previously tested).

OBBN Written test

In addition to the quizzes there will be an OBBN written test administered virtually online. The test is out of 40 marks. Student interested in obtaining their OBBN certification will need to score a minimum of 36. The test will encompass OBBN material related to the OBBN monitoring theory including safe practices, the OBBN program, study design, sampling methodology, and benthic invert diagnostic characteristics. This test is a written test and you will not be asked to identify any BMI under the microscope; however, questions do pertain to the diagnostic characteristics of BMI.

OBBN Lab ID test

In addition to the OBBN written test there is a practical OBBN ID test administered in the lab. Students will be asked to ID a total of 44 specimens. Student interested in obtaining their OBBN certification will need to score a minimum of 40. Normally you would be asked to use a microscope for the test with a timer system for each specimen, however this year an image of the specimen will be displayed and you will have to ID it. The first 5-7 labs will prepare you to ID the specimens.

Assignment

The study of head water drainage features (HDF's) is relatively in its infant stage. In approximately the last 10 years research and industry has begun to realize the importance of HDF's and recognize their value and contribution to aquatic ecosystems on a watershed scale. As such, prior to land use change, HDF's are evaluated and classified using a standardized method following written guidelines which aid in the collection of data that is used in their management decision making process. The assignment has a practical lab component where students go out into the field to evaluate local HDF's (we are still trying to sort out if this is possible). This data is then used and summarized as per the Evaluation, Classification, and Management of HDF's guidelines. The assignment challenges students to use the data through the guideline's management decision making process and write up the results.

Presentation

To cover the diverse range of topics/issues in freshwater ecology, student(s) will choose a topic/current issue related to freshwater ecology and/or biomonitoring and prepare a maximum of 10-20-minute oral presentation (dependent on class size). Presentations must include visual aids (e.g. PowerPoint slides). Topics must be approved by the course instructor to avoid duplication. As many if not all career paths

these days require the employee to contribute and be part of a team setting, the presentations will be done in groups.

The evaluation will be carried out in accordance with the Graduate Grading and Evaluation Practices Policy (and how that policy is interpreted and applied in this Dept.)
http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/grading.pdf

VERIFICATION OF ILLNESS

A *Verification of Illness* **(also known as a "doctor's note") is temporarily not required.** Students who are absent from academic participation for **any reason** (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on **ACORN under the Profile and Settings menu.** Students should also advise their instructor *of* their absence. Visit COVID-19 Information for University of Toronto Students page on the Vice-Provost, Students website for information on this and other frequently asked questions.

EMERGENCY PLANNING
Students are advised to consult the university's preparedness site (http://www.preparedness.utoronto.ca) for information and regular updates regarding procedures relating to emergency planning.

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 the UTSC Accessibility Services as soon as possible: http://www.utsc.utoronto.ca/~ability/
We also suggest you also refer to the following University of Toronto Scarborough Library link:
http://utsc.library.utoronto.ca/services-persons-disabilities

PLAGIARISM
University of Toronto Code of Behaviour on Academic Matters states that "it shall be an offence for a student knowingly: to represent as one's own any idea or expression of an idea or work of another in any academic examination or term test or in connection with any other form of academic work, i.e., to commit plagiarism."

For accepted methods of standard documentation formats, including electronic citation of internet sources please see the UofT writing website at http://advice.writing.utoronto.ca/using-sources/documentation.

The full Code of Behaviour regulations could be found from consulting
https://www.sgs.utoronto.ca/policies-guidelines/academic-integrity-resources/

The University of Toronto has a site license that enables all faculty and students to use Ouriginal, a new plagiarism prevention system. To learn more about the plagiarism detection software - https://q.utoronto.ca/courses/46670/pages/integration-plagiarism-detection-tool. Instructors can email quercus.utsc@utoronto.ca for direct assistance.

"Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their

WRITING AND ENGLISH LANGUAGE
As well as the faculty writing support, please see English Language and writing support at University of Toronto or the Centre for Teaching and Learning at UTSC.

The following is also useful:
 Sylvan Barnett, *A Short Guide to Writing About Art*. 5-7th edition (New York: Harper-Collins, 1997)
William Strunk Jr., E.B. White. The Elements of Style (New York: MacMillan Publishing)

LATE WORK
Late work will be deducted 10% per 24 hours for each 24 hours of being late.

READINGS
Course reading material will be uploaded to Quercus and otherwise can be found online through the provided references.   It is also in the lecture material as references to the provided information.

FINAL EXAM DATE (NO FINAL EXAM)