



**Department of Geography & Environmental Management  
University of Waterloo**

GEOG 407 – Environmental Hydrology  
Winter 2017

Instructor: Dr. M.L. Macrae  
Office: EV1 237  
Phone: x33064  
Office Hours: T 10:00am-11:00am

Class: T 11:30-12:50, Th, 9:30-10:50am  
Location: EV1 350 (T); EV1 131 (Th)  
Email: mmacrae@uwaterloo.ca

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**Course Objectives:**

This course focuses on ecological and biogeochemical processes that are linked to the hydrological cycle and how these relate to the management of natural resources. The objectives of this interdisciplinary course are to explore topics that integrate ecosystem processes with physical hydrology, and examine the impacts of human activities on ecohydrological and hydrochemical processes. This course focusses on the storage and movement of water, solutes and nutrients within selected ecosystems, considering the biogeochemical consequences of human activity.

**Student Evaluation:**

Research Proposal	5%
Presentation	20%
Term Report	40%
Final Exam	35%

**Important Dates/Deadlines:**

Your research proposal will be presented to me via a 20 minute meeting in my office (EV1 237) in Week 5. Please provide a brief (2-3 page) outline of the problem, site selection, methods used, data collection plan at this time (paper copy).

Term Report Due: April 3<sup>rd</sup> by 4 pm. Submitted online to Learn Site (paperless)

Note: Late assignments will be subject to a penalty of 5% per day. There are *no exceptions* unless clear medical documentation is provided. The final exam will take place during the formal exam period.

**Course Reading:**

A copy of two textbooks (Schlesinger, W.H., Biogeochemistry, an analysis of global change (3<sup>rd</sup> edition) and Dingman, L., Physical hydrology) are on 3 hour reserve at the Porter library. Additional 'recommended' readings will be posted online throughout the term. In the lecture notes, I will list readings as required or recommended. If readings are **required**, students are expected to have read them for the final exam.

<b>Week</b>	<b>Tuesday</b>	<b>Thursday</b>
1 (Jan. 3,5)	Introduction, Overview of Water Quality Issues in North America; discussion of topics for term assignment	<b>No Lab Today</b> ; select term paper topics via email with Dr. Macrae by end of day today.
2 (Jan. 10,12)	Watershed Hydrology	Watershed Hydrology Field and Lab Methods for Water Quality 1 (lecture)
3 (Jan. 17, 20)	Biogeochemistry 101 (the basics)	Field and Lab Methods for Water Quality 2 (practical)
4 (Jan. 24, 26)	Biogeochem 101 (the cycles)	Free Work Period
5 (J.31,F.2)	Runoff Generation in Watersheds and Biogeochemical Fluxes	<b>Research Proposals Due (Meetings EV1 237)</b>
6 (Feb. 7, 9)	Vegetation and Biogeochemical Processes/Ecohydrology	Data Collection
7 (Feb. 14, 16)	<b><i>READING WEEK</i></b>	
8 (Feb. 21, 23)	Wetlands and In-stream Processes	Data Collection
9 (F.28, M.2)	Impacts of Climate Change on hydrology and biogeochem: case study of subarctic and temperate peatlands	Data Collection
10 (Mar. 7, 9)	Impacts of Land-use change on hydrology and water quality: Deforestation, Agriculture	Data Collection
11 (Mar. 14, 16)	Free Work Period	Free Work Period
12 (Mar. 21, 23)	407 Student Presentations	407 Student Presentations
13 (Mar. 28, 30)	Synthesis of 407 Student Projects – Discussion	Exam Review Q&A Session

**\*\*Academic Integrity:** To create and promote a culture of academic integrity, the behaviour of all members of the University of Waterloo is based on honesty, trust, fairness, respect and responsibility.

**Grievance:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/policies/policy70.html>

**Discipline:** A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.html>

**Appeals:** A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.html>

Plagiarism detection software (**Turnitin**) will be used to screen assignments in this course. This is being done to verify that use of all materials and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin. In the first week of the term, details will be provided about arrangements and alternatives for the use of Turnitin in this course.

### **Assignments:**

Working in small groups (# per group TBA, based on class enrollment), students will choose a topic (options listed below) and collect water quality data over the course of the term. Students will conduct routine fieldwork for the collection of water samples on the University of Waterloo campus, and, will analyze their own water samples in the Ecology Lab (EV1). No two groups will work on the same specific research question/water quality parameter.

### **Term Report (5% research proposal + 40% for final report)**

This assignment accounts for the majority of your term grade in this course. Fourth year 1.0 credit courses were designed to allow students to critically examine concepts in greater depth, via a ‘project’. The quality and depth of your term projects will reflect this.

The term project in this course will consist of a ~20 page (double spaced) report (+ figures/tables) on one of the topics suggested below. This technical report will consist of a literature review (~8-10 pages) and statement of objectives, a methods section (2 pages), a results section (~4 pages plus figures/tables; and discussion (~2-3 pages) and Conclusions (<1 page) sections. You will be expected to synthesize the data that you have collected in this report. You will be required to meet with me to provide me with a research proposal during the Tuesday class in **Week 5** (meeting in EV1 237). You will be working in small groups and only one report will be submitted per group (i.e. group project).

References/resources for your term project must be from a combination of periodical/journal articles and textbooks, and cannot be from websites. You will be required to pass your paper through turnitin.com prior to submission.

### **Group Presentation (20%)**

Your term project team will present a 10-15 minute conference style presentation of your data set/report using data collected over the term to the rest of the class. As part of this, you will provide background information/context, methods (data collection and brief lab analyses overview), main results and interpretation and conclusions.

### **Final Exam (35%)**

A final exam will be held during the exam period. This will be based on the lecture content throughout the term.

### ***Suggested Term Project Topics:***

- Nitrogen OR Phosphorus Dynamics in Laurel Pond (storage, supply/consumption of N or P during baseflow and snowmelt); possible determination of sources?
- Road salt and chloride in an urban environment (possibly accumulation in snow pack and concentrations in Laurel Creek during thaw events)
- Contribution of campus tile drain to N or P or sediment loading?
- Contribution of key areas of campus (or nearby) (eg. Parking lots, construction) to a water quality parameter (e.g. TSS)?
- How (and why) does a particular water quality parameter in Laurel Creek change between Columbia Ave. and University Ave.? Is this consistent in time? (choose one parameter – e.g. NO<sub>3</sub> or P or sediments or something else)
- Leaching of nutrients from in-stream macrophytes or riparian vegetation in winter
- ***Something else? Must be approved by me!***