



**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: W 2:30-3:30pm

Class: W 4:00-5:20pm, Th, 9:30-10:50am  
Location: HH 336 (T); EV1 134 (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 5<sup>th</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. 3,4)	Introduction	<b>No Lab Today</b>
2 (Jan. 10,11)	Overview of Water Quality Issues in North America; discussion of topics for term assignment	Watershed Hydrology Field and Lab Methods for Water Quality 1 (lecture)
3 (Jan. 17, 18)	Watershed Hydrology	Field and Lab Methods for Water Quality 2 (practical)
4 (Jan. 24, 25)	Biogeochemistry 101 (the basics)	Free Work Period (to work on proposals)
5 (Jan 31, Feb.1)	Biogeochemistry 101 (the cycles)	<b>Research Proposals Due (Meetings EV1 237)</b>
6 (Feb. 7, 8)	Runoff Generation in Watersheds and Biogeochemical Fluxes	Data Collection
7 (Feb. 14, 15)	Wetlands and In-stream Processes	Data Collection
8 (Feb. 21, 22)	<b><i>READING WEEK</i></b>	
9 (Feb.28, Mar. 1)	Impacts of Climate Change on hydrology and biogeochem: case study of subarctic and temperate peatlands	Data Collection
10 (Mar. 7, 8)	Impacts of Land-use change on hydrology and water quality: Deforestation, Agriculture	Data Collection
11 (Mar. 14, 15)	Data Collection	Data Collection
12 (Mar. 21, 22)	407 Student Presentations	Synthesis of 407 Student Projects – Discussion
13 (Mar. 28, 29)	Exam Review Q&A Session	No Lab Today

◆ **Important Dates for Winter 2018 term:**

<http://ugradcalendar.uwaterloo.ca/page/uWaterloo-Calendar-Events-and-Academic-Deadlines> .

◆ **Field Trip Guidelines:**

Field trip guidelines are here: <https://uwaterloo.ca/environment/faculty-staff/policies-procedures-terms-reference/field-trip-and-field-work-guidelines>. Please be informed about UW's Driving Policy for the Use of Personal Vehicles for University Business: <https://uwaterloo.ca/finance/capital-assets/insurance/insurance-coverage>.

◆ **Intellectual Property:**

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

◆ **Academic Integrity:**

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. The University's guiding principles on academic integrity can be found here: <http://uwaterloo.ca/academicintegrity>. ENV students are strongly encouraged to review the material provided by the university's Academic Integrity office specifically for students: <http://uwaterloo.ca/academicintegrity/Students/index.html>

Students are also expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for their actions. Students who are unsure whether an action constitutes an offense, or who need 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. Students may also complete the following tutorial: <https://uwaterloo.ca/library/get-assignment-and-research-help/academic-integrity/academic-integrity-tutorial>

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: <https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-71>. Students who believe that they have been wrongfully or unjustly penalized have the right to grieve; refer to Policy #70, Student Grievance: <https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-70>

◆ **Note for students with disabilities:** AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

◆ **Mental Health:** The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available.** Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services <http://www.uwaterloo.ca/counselling-services> is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more.

◆ **Religious Observances:** Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

◆ **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. See Policy 70 - Student Petitions and Grievances, Section 4, [www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm). When in doubt please contact your Undergraduate Advisor for details.

◆ **Appeals:** A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

◆ **Unclaimed assignments:**

Unclaimed assignments will be retained until one month after term grades become official in quest. After that time, they will be destroyed in compliance with UW's [confidential shredding procedures](#).

◆ **Communications with Instructor and Teaching Assistants:**

All communication with students must be through either the student's University of Waterloo email account or via Learn. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

◆ **Turnitin:** Text matching software (Turnitin®) will be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, and are subject to the USA PATRIOT ACT, 2001; therefore, students must be given an alternative (e.g., scaffolded assignment or annotated bibliography) if they are concerned about their privacy and/or security. Students will be due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin® in this course.

**Assignments:**

Working in pairs or 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/references) 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. Your literature review must be a high quality review of peer-reviewed academic literature related to your topic and you must use appropriate citations (APA). 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.

### ***Example 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? (or a natural or constructed wetland nearby but not necessarily on campus)
- Contribution of campus tile drain to N or P or sediment loading? (or tile drains not on campus if you have access)
- Contribution of key areas of campus (or nearby) to a water quality parameter (eg. Parking lots, construction sites to TSS)
- Road salt and chloride in an urban environment (possibly accumulation in snow pack and concentrations in Laurel Creek during thaw events)
- How (and why) does a particular water quality parameter in Laurel Creek change between north of Columbia Ave. and Silver Lake (S of University Ave)? Is this consistent in time? (choose one parameter – e.g. NO<sub>3</sub> or P or sediments or something else) – does this reflect contributing areas?
- Leaching of nutrients from in-stream macrophytes or riparian vegetation in winter
- ***Something else? Must be approved by me!***
- ***You are NOT required to work on campus for your project (if you have your own transportation)***