



ENVS*6720 Geology of Groundwater Systems

Winter 2019

Section(s): C01

School of Environmental Sciences

Credit Weight: 0.50

Version 1.00 - January 07, 2019

1 Course Details

1.1 Calendar Description

This course will examine the geological characteristics and processes that influence groundwater flow systems and contaminant transport and fate in different geological settings. The course will include seminar discussions of readings, guest speakers from industry and government agencies as well as hands-on exercises in class.

1.2 Course Description

Geology often plays an important role in groundwater flow systems, influencing recharge to aquifers as well as contaminant fate and transport. This course will explore the relationship between geology and groundwater through selected readings and assignments. Students will gain a better understanding of subsurface heterogeneity in previously glaciated settings, the role of tectonics and sea level change over geologic time in determining the nature of sedimentary rock successions, and the effect of secondary processes on the nature of the materials through which groundwater and contaminants flow. The course will include several guest speakers from industry and government agencies.

1.3 Timetable

Tuesday and Thursday 10-11:30 in ALEX 265, unless doing a core lab in ALEX 024 (see schedule of activities).

1.4 Final Exam

No exam

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Emmanuelle Arnaud
Email:	earnaud@uoguelph.ca
Telephone:	519-824-4120, xt 58087
Office:	Alex 126
Office Hours:	Please make an appt by email.
Lab Co-ordinator:	Alyson Brown
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3 Learning Resources

3.1 Additional Resource(s)

Other Resources (Other)

All readings will be from the literature, available online.
 Check the **course website** and **ARES** for additional in-course resources and information. Login to courselink with your email login and password at <http://courselink.uoguelph.ca/index.html>. You can access ARES through the Library website.

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Explain what depositional and post depositional processes influence the characteristics of different glaciated settings/deposits that would affect groundwater flow and/or contaminant transport.
2. Explain what depositional and post depositional processes influence the characteristics of different sedimentary rock types that would affect groundwater flow and/or contaminant transport.
3. Create a conceptual model of their own through a literature review that synthesizes the geological conditions at multiple scales that would impact groundwater or on the fate and transport of a contaminant in a particular geological setting.

4. Explain the types of geological data sets needed to inform ground water site investigations through case study analysis.
5. Identify and describe sediments and sedimentary rock types using standard sedimentological techniques through logging both Quaternary and sedimentary rock core.

5 Teaching and Learning Activities

The course will consist of readings and weekly discussion seminars with several guest lectures from industry and government. You are responsible for reading the material before the seminar and are to come prepared to discuss the major points covered in the readings. You will be responsible for leading the discussion once during the term by presenting a brief overview of the readings. We will spend some of the class time synthesizing our understanding each week in our journal. The course will also involve a term paper that will be peer reviewed. Dates are subject to change as I schedule guest lectures; please check the course website for updates to the schedule.

5.1 Lecture

When	Topic(s)	Details
January 10	Introductions	
January 15/17	Geological models in hydrogeology	
January 22, 24	Hydrostratigraphy in Quaternary sediments	Intro Lab: description of sedimentary deposits (not marked)
January 29, 31	Quaternary aquitards	Guest lecture: Laura Weaver
February 5, 7	Quaternary sediment core lab in ALEX 024	
Feb 12, 14	Waterloo Moraine	Guest Lecture: TBA;

When	Topic(s)	Details
		Quaternary core lab report due
February 18-22	February break-NO CLASSES	
Feb 26, 28	Regional-scale groundwater geoscience in southern Ontario Open House	Term Paper due and peer review how-to workshop
March 5, 7	Glaciofluvial environments	PEAR Peer review due
March 12, 14	Sedimentary rocks core lab in ALEX 024	Open House assignment due
March 19, 21	Sedimentary rocks- clastics, oral presentations	Guest lecture: Bill Banks Bedrock core lab report due
March 26, 28	Sedimentary rocks -carbonates; oral presentations	Guest lecture: Steve Worthington
April 2, 4	Sedimentary rock at the regional scale; oral presentations	Guest lecture: Terry Carter Final paper due

5.2 Guest Lectures

Tentative guest speakers and topics

Laura Weaver (Matrix Solutions Inc.) Hydrogeological modeling in Quaternary glacial deposits.

Bill Banks (Banks Groundwater Engineering Limited) Discovery and development of a safe and sustainable bedrock groundwater supply for the Town of Shelburne,

Southern Ontario, Canada.

Terry Carter (consulting geologist; previously Chief Geologist, MNR, Petroleum Operations). Groundwater resources and Paleozoic bedrock of Ontario

Steve Worthington (Worthington Groundwater)- Preferential flow in karstic bedrock with example from the Walkerton, Ontario tragedy

TBD- Geological mapping of Quaternary deposits in the context of groundwater resource management.

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Journal	20
Paper	50
Core Lab Report	10
Open House Assignment	10
Seminar Participation and Seminar Lead	10
Total	100

6.2 Assessment Details

Journal (20%)

Due: April 8

Learning Outcome(s): 1,2,4

Paper (50%)

Due: March 1, March 8, April 5

Learning Outcome(s): 3

March 1: Term Paper due

March 8: Peer Review due (10%)

April 5: Revised term paper due (40%)

Core Lab Report (10%)

Due: Feb 15 or Mar 22

Learning Outcome(s): 5

Open House Assignment (10%)

Due: Fri, Mar 15, 5:00 PM

Learning Outcome(s): 1,2,4

Seminar Participation and Seminar Lead (10%)

Due: Variable

Learning Outcome(s): 1,2,4

6.3 Additional Notes

Oral presentation based on your paper in the last weeks of term will be very informal and not marked-this is mostly designed so we can learn from each other about all the neat things we've been reading! The introductory lab is mostly a review/refreshers and is also unmarked. For the lab report-you will pick either the Quaternary or bedrock core lab to submit.

7 Course Statements

7.1 Grading Policies

Late assignment will be penalized 10% per day and will no longer be accepted a week after the due date.

*Please note that these policies are binding unless academic consideration is given to an individual student. If you cannot meet a course requirement, please get in touch as soon as possible and preferably before the due date to discuss a possible alternative due date.

7.2 Group Work

Group work is encouraged when completing assignments or discussing readings though students will have to write individual assignments making it essential that individuals complete their own work throughout the course.

8 University Statements

8.1 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.

8.2 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>

8.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for course registration are available in the Undergraduate and Graduate 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>

8.4 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.

8.5 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 book their exams at least 7 days in advance and not later than the 40th Class Day.

More information can be found on the SAS website

<https://www.uoguelph.ca/sas>

8.6 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>

8.7 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.

8.8 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>
