

2026–2027 / Fall 2026

Contaminant Hydrogeology

Academic year & term	2026–2027 / Fall 2026
Course title	Contaminant Hydrogeology
Department/School	Department of Civil and Environmental Engineering
Course number and section	ENVE 4006/5301

Teaching Team

Instructor	Cole Van De Ven
Email	cole.vandeven@carleton.ca
Office location & phone	CB 6210
Office hours	Please email Prof. Van De Ven to book a meeting time
TA(s)	Information will be posted on Brightspace

Course Description and requirements

1) Course schedule

Please refer to the Public Class Schedule for the most recent information.

2) Course description

Contaminant hydrogeology focuses on groundwater flow and contaminant fate and transport with the goal to assess and remediate subsurface soils and groundwater. This course relies on background knowledge in water resources engineering and contaminant transport. The course will develop conceptual and numerical skillset in contaminant hydrogeology.

3) Precluded courses

None.

4) Prerequisites and recommended knowledge

ENVE 3003 and ENVE 3004

5) Learning Outcomes

1. Apply the basic concepts of groundwater flow and contaminant fate and transport
2. Solve the advective velocity of contaminants in the subsurface
3. Solve the concentrations of contaminants in the subsurface under different fate and transport processes such as diffusion, dispersion, adsorption, decay, microbial degradation, etc.
4. Calculate the flow and transport processes in the unsaturated zone; estimate travel times in the unsaturated zone
5. Apply the basics of numerical modelling including the need for boundary conditions and initial conditions, and limitations of numerical modelling to model subsurface systems
6. Solve the flow and transport processes in a multiphase system in which a non-aqueous phase liquid like gasoline or a solvent is released in the subsurface
7. Evaluate the geology, hydrogeology and chemical components of a contaminated site to develop a conceptual model
8. Compare and contrast the processes and goals of different remediation technologies used to clean up contaminated sites
9. Design plans and processes to characterize and remediate contaminated sites

6) Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) requires graduates of undergraduate engineering programs to possess 12 attributes. Courses in all four years of our programs evaluate students' progress towards acquiring these attributes. Aggregate data (typically, the data collected in all sections of a course during an academic year) is used for accreditation purposes and to guide improvements to our programs. Some of the assessments used to measure GAs may also contribute to final grades; however, the GA measurements for individual students are not used to determine the student's year-to-year progression through the program or eligibility to graduate. The following list provides the GAs that will be measured in this course, along with the Learning Outcomes that are intended to develop abilities related to these attributes.

Graduate Attribute	Assessment Tool
GA 1.11.C Discipline-specific concept; Water Resources/Contaminant Hydrology	Final Exam
GA 2.1 Problem Analysis; Problem definition	Assignments
GA 2.2 Problem Analysis; Approach to the problem	Assignments
GA 2.3 Problem Analysis; Use of assumptions	Assignments
GA 2.4 Problem Analysis; Interpreting the solution – validity of results	Assignments
GA 5.1 Engineering Tools; Diagrams and engineering sketches	Assignments
GA 5.3 Engineering Tools; Tools for design, experimentation, simulation, visualization and analysis	Assignments
GA 5.5 Engineering Tools; Limitations of such tools and the assumptions inherent in their use	Assignments

For information on GAs and continual curriculum improvement, visit the Accreditation section of the Engineers Canada website.

7) Accreditation Units

Math	Natural Science	Complementary Studies	Engineering Science	Engineering Design
0.0	0.0	0.0	75.0	25.0

8) Textbook(s)/Learning Materials and their costs

Students are not required to purchase textbooks or other learning materials for this course.

The following textbooks are good references for this course.

- Freeze and Cherry, Groundwater, 1979, available through the Groundwater Project (<https://gw-project.org/books/groundwater/>) - Free
- Pankow and Cherry, Dense Chlorinated Solvents, 1996, available through the Groundwater Project (<https://gw-project.org/books/dense-chlorinated-solvents-and-other-dnaps-in-groundwater/>) – Free

9) Topics and tentative plan

Week / date	Topics	Activities / labs / PA	Deadlines / tests
Week 1	Welcome and Chapter 1 - Introduction; Chapter 2 - Groundwater flow and wells	Biosheet	September 18th
Week 2	Chapter 2 - Groundwater flow and wells	Assignment #1 Released	
Week 3	Chapter 3 - Unsaturated groundwater flow	Assignment #1 Due	October 2nd
Week 4	Chapter 3 - Unsaturated groundwater flow	Assignment #2 Released	
Week 5	Chapter 4 - Contaminant transport	Assignment #2 Due	October 16th
Week 6	Chapter 4 - Contaminant transport	Assignment #3 Released	
Week 7	Chapter 5 – Numerical modeling	Midterm	November 5th
Week 8	Chapter 5 – Numerical modeling	Assignment #3 due; Assignment #4 Released	November 11th
Week 9	Chapter 6 - Multiphase flow and contaminants	Assignment #4 Due	November 20th
Week 10	Chapter 6 - Multiphase flow and contaminants	Assignment #5 Released	
Week 11	Chapter 7 – Remediation		

Week 12	Chapter 7 – Remediation	Assignment #5 Due	December 9th
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Final examination will be set by Examination Services.

10) Evaluation and marking scheme

ENVE 4006

Component	Weight (%)	Individual work?	Notes
Biosheet Bonus	1%	Yes	Bonus grade
Assignments (5)	15.0	Yes	
Midterm Exam	30.0	Yes	
Final Examination	55.0	Yes	

ENVE 5301

Component	Weight (%)	Individual work?	Notes
Assignments (5)	15.0	Yes	
Midterm Exam	25.0	Yes	
Final Examination	45.0	Yes	
Project	15.0	Yes	Details on Brightspace

a) Final Examination

Final exams are for evaluation purposes and will not be returned to students.

Exam Conditions: Closed book

Final Exam Weight: 55.0%

Students who are unable to write the final examination because of extenuating circumstances, as defined in the Academic Consideration Policy, may apply for accommodation by contacting the Registrar's office. Consult Section 4.3 of the University Calendar.

b) Exam format and e-proctoring statement

The final examination will be written on campus and proctored.

c) Additional requirements

All students must achieve a mark of 35% or higher on the MIDTERM to pass the course.

All students must achieve a mark of 40% or higher on the FINAL EXAM to pass the course.

Smart watches, smart glasses, mobile phones, and other communication-, recording-, or internet-capable electronic devices are not permitted during examinations unless specifically authorized as an approved accommodation.

d) Term work late submission policy

Requests for extensions will be assessed by the instructor on a case-by-case basis. Any non-approved late submissions will be deducted 10% per day, until the solutions are posted at which point the grade will be zero.

e) Deferred term work and self-declaration

Students who claim extenuating circumstances defined in the Academic Consideration Policy, as a reason for missed term work, are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor. This must occur no later than three (3) days after the term work was due. The

alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. Consult Section 4.4 of the University Calendar.

The same policy applies to missed midterm examinations/tests.

11) Academic dates

Students should be aware of the academic dates (e.g. last day for academic withdrawal) posted on the Registrar's office web site <https://carleton.ca/registrar/registration/dates/academic-dates/> or Calendar website.

Academic Integrity and Plagiarism

Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures: <https://carleton.ca/engineering-design/current-students/fed-academic-integrity> Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or expulsion.

One of the main objectives of the Academic Integrity Policy is to ensure that the work you submit is your own. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own. This includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source.

Examples of violations of the policy include, but are not limited to:

- any submission prepared in whole or in part by someone else;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own;
- failing to acknowledge sources of information through proper citations when using another's work and/or failing to use quotation marks.

Unauthorized Dissemination

As per Carleton's Academic Integrity Policy, Unauthorized Dissemination is a violation of the standards of academic integrity to publish, disseminate, or otherwise make available to a third-party instructional material where the instructor has explicitly prohibited their dissemination.

The materials (including the course outline, slides, posted notes, videos, labs, projects, assignments, quizzes, exams, and solutions) created for this course are intended for personal use only. They may not be reproduced, redistributed, or disseminated in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise—without written permission from the author(s), both during and after the semester.

Generative Artificial Intelligence (GenAI)

Permitted use: GenAI use is not permitted for any submitted work in this course.

Documentation / acknowledgement: N/A

Rationale: This course requires original calculations and discussion to be generated by the student without the use of GenAI

Limitations / prohibited use: GenAI cannot be used for any reason on submitted Assignments.

As our understanding of the uses of GenAI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of GenAI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Safer Learning and Working Environment

Carleton University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca, Ombuds Services - Carleton University or submit an anonymous human rights concern through the University's online human rights concern form.

Academic Accommodations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).

Engineering Academic Advising

The Engineering Academic Support Service assists undergraduate engineering students with course selection, registration, and learning support from first-year through to graduation.

Academic Advisors Contact can be found here: <https://carleton.ca/engineering-design/current-students/undergrad-academic-support/undergraduate-advisors/>.

Student Mental Health and Wellness

As a university student you may experience a range of mental health challenges that can significantly impact your academic success and overall well-being. Carleton's Wellness Services Navigator is designed to help students connect with mental health and wellness resources.

If you need to talk to someone from the department for more information and support with connecting to resources, you can contact the following faculty members, depending on your program, or contact the department.

Department: CEEUGChair@cunet.carleton.ca

Prof. Shoeleh Shams — shoelehshams@cunet.carleton.ca — 4242 Mackenzie

ACSE: Prof. Cara Lozinsky — caralozinsky@cunet.carleton.ca — 2374 Mackenzie

CIVE: Prof. Christian Viau — Christian.Viau@carleton.ca — 4535 Mackenzie

ENVE: Prof. Cole Van De Ven — cole.vandeven@carleton.ca — 6210 Canal Building

Additional on-campus and off-campus resources are available through Carleton's wellness and counselling services:

1. **Carleton's Wellness Desk:** Located at 204A MacOdrum Library, is a space for students to learn about resources, connect with our Wellness Coordinator, and decompress during stressful times of the year. You can pop into the Wellness Desk any time during its hours of operation – no appointments necessary! <https://wellness.carleton.ca/mental-health/wellness-desk/>
2. **Carleton's Health and Counselling Services:** To book an appointment contact the main clinic by calling (613) 520-6674. If urgent, let the Patient Care Coordinator know or go in person to the main clinic (2500

Carleton Technology and Training Centre Building) and indicate that they are in crisis and need to speak to someone right away. <https://carleton.ca/health/>

3. **Residence Counselling and Wellness Service:** Counselling services specifically for students in residence. <https://carleton.ca/health/residence-counselling/>
4. **Therapy Dogs:** Carleton's therapy dogs are around campus with their owners (who are Carleton University staff and faculty) to comfort and provide support to help you thrive as a university student. <https://wellness.carleton.ca/mental-health/therapy-dogs/>
5. [Emergencies and Crisis](#) and [Emergency Numbers](#)
6. **Good2Talk (1-866-925-5454):** Good2Talk is a free, confidential helpline providing professional counselling and information and referrals for mental health, addictions and well-being to post-secondary students in Ontario, 24/7/36 <https://good2talk.ca/>
7. **The Walk-In Counselling Clinic (off-campus community resource):** The Walk-in Counselling Clinic has offices in various locations across Ottawa and the greater Champlain region that are open 7 days a week. Individuals will be assisted, with no appointment, on a first-come, first-serve basis during the Walk-in Counselling Clinic hours. The Walk-in Counselling Clinic **offers services in many languages** and is free and confidential. More information can be found at: <https://walkincounselling.com/>
8. **Distress Centre of Ottawa and Region:** Available 10am-11pm, 7 days/week, 365 days/year. **Distress Line:** 613-238-3311, **Crisis Line:** 613-722-6914 or 1-866-996-0991, **Text:** 343-306-5550. <https://www.dcottawa.on.ca/>
9. **Distress and Crisis Ontario**, Available for chat 2 pm – 2 am EST. <https://www.dcontario.org/>
10. **BounceBack Ontario (Toll-Free: 1-866-345-0224)** is a free skill-building program managed by the Canadian Mental Health Association (CMHA). It is designed to help adults and youth 15+ manage low mood, mild to moderate depression and anxiety, stress or worry. Delivered over the phone with a coach and through online videos, you will get access to tools that will support you on your path to mental wellness. <https://bouncebackontario.ca/>.