

Carleton University
Department of Civil & Environmental Engineering

ENVE 2001: Process Analysis for Environmental Engineering Winter 2024

Professor:	Prof. Cole Van De Ven P.Eng., Ph.D.
Office:	Engineering Design Centre (EDC) 4531
Email:	cole.vandeven@carleton.ca
Office hours:	To be decided based on class survey
Lecture time*:	Wednesdays 8:35 to 10:25 am NI 4040
PA Session time*:	Fridays 8:35 to 11:25 am SA 518
TAs	TBA

*Please refer to the [Public Class Schedule](#) for the most recent information

Course Description

The objective of this course is to introduce students to common environmental engineering processes and their solutions/analysis. This relies on understanding and quantifying environmental parameters and formulating links between known and unknown variables. For that, definition and quantification of major parameters will be reviewed, principles of mass and energy balances for different environmental engineering and energy systems will be discussed, and their implementation in problem solving and process analysis will be practiced.

Course Learning Outcomes (CLOs)

By the end of the course, you will be able to:

1. Understand and implement definitions, dimensions, and units of common environmental engineering parameters.
2. Identify and quantify common environmental engineering processes.
3. Formulate material and energy balances in environmental engineering processes.
4. Implement material balances to analyze systems with and without reactions.
5. Apply thermodynamic principles to analyze closed and open systems with energy transfers.
6. Recognize examples of life cycle analysis in environmental engineering.
7. Develop engineering problem solving skills.

Graduate Attributes (GAs)

Engineering programs are accredited by the Canadian Engineering Accreditation Board (CEAB). As part of this process, we collect GA data to assess how effectively we are teaching or conveying the GAs with a goal to continually improve our programs. The GA data are aggregate data for a course and are NOT linked to student names or student numbers. The GAs assessed in this course include the following:

- 2.1 - Problem definition.
- 2.2 - Approach to the problem.
- 2.3 - Use of assumptions.
- 2.4 - Interpreting the solution - validity of results.

Outline of Course Topics and Progression

Please know the approximate weeks are subject to change:

Week* (approximate)	Anticipated Topic*	Assessments*
1	Welcome and Chapter 1 - Introduction to process analysis: units, dimensions, engineering calculations	Biosheet bonus, Assignment 1 Release
2	Chapter 2 - Processes and process variables: process definitions, analysis, process variables	Assignment 1 Due
3		Assignment 2 Release
4	Chapter 3 - Material balances: conservation of matter, material balance equation, solving balances, single-material systems, multiple materials	Assignment 2 Due
5		Assignment 3 Release
6	Chapter 4 - Transformations: chemical reactions, equilibrium transformations, time-dependent transformations, reacting mass balances	Assignment 3 Due
7		Midterm
8		Assignment 4 Release
9	Chapter 5 – Energy balances: forms of energy, First law of Thermodynamics, closed systems, open systems	Assignment 4 Due
10		
11		Assignment 5 Release
12	Chapter 6 – Life cycle analysis (LCA): principles of LCA, utilizing balances	Assignment 5 Due

* Subject to change. I reserve the right to revise as the course progresses.

Lecture Notes

Blank lecture notes will be posted on Brightspace prior to starting a chapter. The notes are designed to supplement lectures, but do not represent the complete content of the course (for that you should attend the lectures). Some sections of the notes are left blank. We will fill them throughout lectures but filled notes will not be provided. Please be prepared to fill in your notes by hand, tablet, computer, or any approach you find works best for you.

Course Communication

All class-wide communications will be posted on the news page of Brightspace and announced in class. You are welcome to email me with any questions, but emails should be used for important and/or time sensitive matters. Please start your email subject “ENVE 2001 –” then your subject. This will ensure a more rapid response.

All blank notes, assignments, PA session problems, dropboxes, etc. will be posted to Brightspace.

PA Sessions

PA sessions will be run by teaching assistants (TAs), **starting Week 2 or 3 (to be announced)**. During these sessions, TAs will solve example problems that help you prepare for assignments and exams. The last hour of each PA session will be your TA’s office hour when they will answer your questions.

Attending PA Session is not mandatory but highly recommended.

Reference Materials (optional)

The following textbooks are good references for this course. Please note that it is **NOT** necessary to purchase these books.

- Felder, Rousseau & Bullard, Elementary Principles of Chemical Processes, 4th Ed., 2018, Wiley
- Davis & Masten, Principles of Environmental Engineering and Science, 2nd Ed., 2009, McGraw Hill
- Nazaroff & Alvarez-Cohen, Environmental Engineering Science, 2001, Wiley

Assessment

Assessment	Weight
1. Assignments (5) *	20%
2. Midterm*	30%
3. Final exam *	50%
Bonus Biosheet	1%

*These assessments will include marks for Engineering Problem Analysis Approach/Skills (described below). These are marks assigned to the assessment, formulation, and interpretation of an engineering problem and solution. It is imperative that this framework be used to solve engineering problems and are vital skills needed for the remainder of your engineering education and future practice.

Brief descriptions:

Assignments:

To aid your mastery of the course concepts, problems will be assigned as 5 assignments (one for each Chapter from 1 to 5, no assignment for Chapter 6). Doing the assignments will help prepare you for exams. Marks are awarded for a complete and proper writing of the solution (including units, assumptions, conclusion statements, etc.), **not just the right answer**. Assignments should be submitted on Brightspace in **1 file** in acceptable format (PDF). Assignments will include marks for Engineering Problem Analysis Approach/Skills.

Midterm:

Midterm will be held during the term (approximately **Week 7** during PA sessions). It will be a closed book (formula sheet will be provided) covering **Chapters 1 to 3**, that serves as formative assessment of your learning. Midterm will be proctored by the teaching team. Marks are awarded for a complete and proper writing of the solution (including units, assumptions, conclusion statements, etc.), **not just the right answer**. The midterm will include marks for Engineering Problem Analysis Approach/Skills.

Final Exam:

This course has a **three-hour** final exam (to be scheduled in final exam period) which will be an individual closed-book test on **all chapters**. Marks are awarded for a complete and proper writing of the solution (including units, assumptions, conclusion statements, etc.), **not just the right answer**. The final will include marks for Engineering Problem Analysis Approach/Skills. Please note:

- i) Final exams are for evaluation purpose and will not be returned to students.
- ii) Students who are unable to write the final examination because of a serious illness/emergency or other circumstance beyond their control may apply for accommodation by contacting the Registrar's office. Consult the [Section 4.3 of the University Calendar](#). Distance exams are not approved by the instructor.

Biosheet Bonus:

Provide a **one-page** Biosheet with the following components:

- A photo of yourself
- Your name and preferred name (if applicable)
- Hometown
- Favorite first-year course
- Reason for choosing your discipline of engineering
- Work experience (it's okay, if you don't have much. You could also talk about interesting projects you've done in school)
- Career Aspiration

The format is up to you. Please note, the biosheet must be submitted by the detailed due date or you will not receive the bonus marks.

Engineering Problem Solving Approach/Skills:

For every assessment where engineering problems are solved (i.e., every assignment, midterm and final) at total of 5 marks will be part of the overall mark distribution, which will assess your Engineering Problem Solving Approach/Skills. These are marks assigned to the assessment, formulation, and interpretation of an engineering problem and solution. It is imperative that this framework be used to solve engineering problems and are vital skills needed for the remainder of your engineering education and future practice. For each problem, your solution should be structured in the following way:

- 1) **Problem Statement:** A concise restatement of the problem, including the given information and a statement of what is required.
- 2) **Problem conceptualization:** A sketch or diagram of the problem (when applicable).
- 3) **Assumptions:** A statement of any assumptions needed to solve the problem.
- 4) **Solution:** The solution itself, clearly laid out with statements of the fundamental principles involved; descriptions of the mathematical steps taken; any additional information, references and citations clearly indicated, as required.
- 5) **Final conclusion and discussion:** The answer should be clearly indicated and, importantly, discussed in terms of its reasonableness and its consistency with any assumptions made.

Marks will be awarded for each of the 5 components. Mark will be given on a “two-strike basis”, the first time you do not include one of the components, you will lose 0.5 marks for the component, if you don’t include a second time you will receive a 0 for the overall component. This is very important therefore, that is reflected in this grading approach.

As an example, imagine 2 of the 5 questions on an assignment require a process diagram (Problem Conceptualization). If you include all other components but did not include a process diagram for one of the questions, your Engineering Problem Solving Approach/Skills mark would be 4.5/5. If you didn’t include a single process diagram, your Engineering Problem Solving Approach/Skills mark would be 4/5.

Missed Term Work

Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for alternate arrangements with the instructor and in all cases, this must occur no later than **three (3) calendar 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. The accommodation provided will be shifting the weight to the final exam, only if a self-declaration form has been received within 3 calendar days. To request academic consideration for a missed assessment, please submit a “Self-Declaration Form” (found [here](#)) to me with 3 calendar days. Consult [Section 4.4 of the University Calendar](#).

Late Submission Policy

Without a valid or recognized accommodation or if no self-declaration form is submitted within 3 calendar days, a penalty of 10% per day will be given for all assessments (this, of course, does not apply to the midterm and final exam which are given 0 if missed). For assignments, late submissions

are not accepted after the solution set is posted and will result in a grade of zero, unless appropriate documentation is provided.

Appeals

Please bring any grading appeals to my attention within **5 calendar days** of grades being posted. Please write a brief description of your concern and submit to me. I will then review and discuss with you, if needed. **Teaching Assistants will not change any marks.** These concerns must be directed to the instructor.

Course Material Copyright

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors, guest lecturers and students, are copyright protected and remain the intellectual property of their respective author(s). **All course materials, including notes, outlines, recordings, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).**

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to record lectures on their own. Students are not permitted to reproduce or distribute lecture notes, recordings, and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

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/>

Academic Integrity

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 sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, art works, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

Examples of plagiarism include, but are not limited to:

- any submission prepared in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- 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; and

- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course or even suspension or expulsion from the University.

Final Grades

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

Course Completion

Please take careful note of Section 5.1 of the Academic Regulations in the Undergraduate Calendar (<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/grading/#credit>): *"To obtain credit in a course, students must satisfy the course requirements as published in the course outline."*

Addressing Human Rights Concerns

The 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](mailto:equity@carleton.ca) at equity@carleton.ca.

We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone's personal beliefs, choices, and opinions.

Academic Accommodation

Students with diverse learning styles and needs are welcome in this course. You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows. For more information, please consult: <http://students.carleton.ca/course-outline>

Pregnancy Obligation

Please contact the instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please consult: <http://students.carleton.ca/course-outline>

Religious Obligation

Please contact the instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please consult: <http://students.carleton.ca/course-outline>

Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613- 520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your *Letter of Accommodation* at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). *Requests made within two weeks will be reviewed on a case-by-case basis.* After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (<http://www.carleton.ca/pmc>) for the deadline to request accommodations for the formally scheduled exam (if applicable).

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working, and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available and to obtain information about sexual violence and/or support, please visit: <http://www.carleton.ca/sexual-violence-support>

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact the instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more information, please consult: <http://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/>.

Mental Wellness

If you find yourself suffering during this or any other term from anxiety, stress, or issues related to mental health, this is nothing to be ashamed of. It is highly recommended that you seek help; refer to [Counselling Services](#). You are also welcome to reach out to me to discuss on-campus 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 at or CEEUGChair@cunet.carleton.ca.

ACSE: Prof. [Scott Bucking](#)

Email: scott.bucking@carleton.ca, Office: 5209 Canal Building

CIVE: Prof. [Heng Khoo](#)

Email: heng.khoo@carleton.ca, Office: 3364 Mackenzie

ENVE: Prof. [Shoeleh Shams](#)

Email: shoeleh.shams@Carleton.ca, Office: 4242 Mackenzie

Here is a list of on-campus and off-campus recourses:

1. **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. For more information, please see <https://carleton.ca/health/>
2. [Emergencies and Crisis](#) and [Emergency Numbers](#)
3. **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/>
4. **Empower Me:** Undergraduate students have access to free counselling services in the community through Empower Me, either in person, by telephone, video-counselling or e-counselling. **This free service is accessible 24/7, 365 days per year.** Call **1-844-741-6389 (toll free)** to make an appointment with a counsellor in the community. More information is available <https://students.carleton.ca/services/empower-me-counselling-services/>
5. **The Walk-In Counselling Clinic (off-campus community resource):** The walk-in Counselling Clinic have 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/>

6. **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/>
7. **Distress and Crisis Ontario, Available for chat 2 pm – 2 am EST.** <https://www.dcontario.org/>
8. **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/>.