Western University - Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 2217a
Introduction to Environmental Engineering
Course Outline Fall 2023

This course introduces the application of science and engineering principles to understand environmental processes including the links between human activity, environmental sustainability, and engineering design. The course emphasizes the role of the engineer in protecting human health and the environment. The course provides an introduction to environmental engineering principles, but also provides concepts that are relevant to all civil engineering careers. The general objectives are for the student to become able to:

- Identify key components of the physical environment and how they are influenced by human activity.
- Understand the challenges of population growth, climate change and sustainability and their relevance for engineering practice.
- Apply fundamental principles of physics and chemistry for analyzing and solving engineering problems related to water resources, water pollution, water and wastewater treatment, and solid waste management.
- Recognize how culture, societal factors and economics frame environmental issues and engineering solutions.
- Understand the concepts of sustainable development and design, and environmental stewardship.
- Improve communication and teamwork skills through undertaking individual written components in assignments, working on a group project, and delivering a group presentation.

Antirequisite(s): Chemistry 2210A/B.

Prerequisite(s): Chemistry 1302A/B or the former Chemistry 1024A/B.

Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact Hours:

3 lecture hours/week (required);

2 tutorial hours/week;

Tutorials are not mandatory except when there are guest lectures during this time. Example problems will also be solved during some tutorial sessions. Students seeking assistance with assignments or clarification on lecture material are strongly encouraged to attend these tutorials.

Key Sessional Dates:

Classes begin: September 12, 2023

Fall Reading Week: October 30 – November 5, 2023

Classes end: December 8, 2023

Exam period: December 10 – 22, 2023

Contingency plan for an in-person class pivoting to 100% online learning

"In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online at the discretion of the course instructor"

Instructor:

Dr. Clare Robinson
e-mail: crobinson@eng.uwo
Office hours: TBA

Administrative Assistant: Sandra McKay (smckay@uwo.ca)

Textbook:

Course notes (with gaps) will be provided. These should be downloaded from the course website in advance of the lecture. The gaps will be filled in during the lectures and should be done by the student in their own set of notes; this promotes active learning. Solutions to example problems will also be provided during the lectures and tutorials and these, as well as the gap-filled notes, will **NOT** be posted on the course website.

Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All course material will be posted to OWL: http://owl.uwo.ca.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Units:

SI unit systems will be adopted in assignments, test, and examination.

Specific Learning Objectives [GA Indicator **– bold** denotes evaluated indicator**]:**

I. Human Population Growth, Climate Change and Sustainability

At the end of this section, the student should be able to

(a) Appreciate the challenge of population growth for environmental sustainability and engineering practice [IESE1].
(b) Understand, differentiate and manipulate equations for exponential and logistic growth and apply to environmental problems including population growth [KB1, CS2].
(c) Understand the basic science of climate change, its drivers and predicted trajectories, and how this relates to engineering design [IESE1].
(d) Appreciate the principles of sustainable development and design [**IESE 2**].

II. Water Resources

At the end of this section, the student should be able to:

(a) Recognize the major parts of the hydrologic cycle [KB3]
(b) Understand material balances and solve hydrologic mass balance problems [KB3, PA1, **PA2**].
(c) Understand and apply the basic principles of rainfall and runoff analysis [KB4, PA2].
(d) Recognize the effect of urbanization on stormwater runoff and appreciate different stormwater management approaches [IESE1, **IESE2**]
(e) Understand the basic principles of groundwater resources and perform groundwater flow calculations [KB3,PA2,**PA3**].

III. Water Pollution

At the end of this section, the student should be able to:

(a) Identify the physical and chemical properties of water [KB2, KB3].
(b) Articulate the social and geopolitical dimensions of water pollution, water shortages and water disparity [**IESE1**, **IESE3**, PR2, **CS2, CS3**].
(c) Understand the major classes of pollutants in environmental water systems, such as pathogens, nutrients, heavy metals, and emerging contaminants [KB3, KB4].
(e) Appreciate water quality standards and regulations [PR2].
(f) Demonstrate knowledge of professional ethics related to water pollution and engineering issues [**EE1,** PR2].

IV. Drinking Water and Wastewater Treatment

At the end of this section, the student should be able to:

(a) Recognize drinking water sources and advantages and disadvantages of different sources [KB4]
(b) Understand the physical and chemical processes behind each stage of conventional drinking water treatment process [KB3, KB4].
(c) Understand the physical and chemical processes behind each stage of conventional wastewater treatment process [KB3, KB4].
(d) Perform calculations related to drinking and wastewater treatment technologies [PA2, **PA3**]

V. Solid Waste Management

(a) Understand modern waste management practices including the role of landfills [KB4].

(b) Appreciate 3R's (Reduce, Reuse and Recycle) in the design of a waste management strategy and be familiar with the advantages and limitations of recycling [KB4, IESE1, **IESE3**]
(c) Describe alternative techniques for waste treatment (incineration and energy from waste; composting; bioconversion; waste processing and landfilling) [KB4]
(d) Understand basic principles of landfill design to minimize environmental impact including water and air pollution and perform calculations [KB4, IESE1].

The instructor may expand or revise material presented in the course as appropriate.

General Learning Objectives:

E=Evaluate, T=Teach, I=Introduce; (I) = Introduction, (D) = Developing, (A) = Advanced level

Knowledge Base	T	Engineering Tools		Impact on Society	E (I)
Problem Analysis	E (I)	Team Work	I (I)	Ethics and Equity	I (I)
Investigation		Communication	E (I)	Economics and Project Management	
Design		Professionalism	I (I)	Life-Long Learning	I (I)

Evaluation:

The final mark will be determined as follows:

Participation	10 %
Assignments	20 %
Midterm Test	20 %
Project	10 %
Final Examination	40 %
Total	100 %

Note**:** **Students must pass the final examination to pass this course. Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less. Students who have failed this course previously must repeat all components of the course. No special permissions will be granted enabling a student to retain assignment or test marks from previous years. Previously completed assignments cannot be resubmitted.**

1. Midterm Test:

The midterm test will be 1 hour 30 min.
Tentative Date: Tuesday Oct 24.
Room: TBA

The midterm will be **CLOSED BOOK: no programmable calculators or other external sources of information, including books, notes or crib sheets, are permitted**. A list of equations will be provided on the exam (and posted one week prior to the exam). Only non-programmable calculators acceptable to the Department for closed book exams will be permitted; check with the Department of Civil and Environmental Engineering Office. **Part marks may not be awarded for some of the problems on the midterm or final exam.**

2. Final Examination:

The final exam will be 3 hours on a date to be determined. Consult the final exam schedule when published.

The final examination will be **CLOSED BOOK: no programmable calculators or other external sources of information, including books, notes or crib sheets, are permitted**. A list of equations will be provided on the exam (and posted one week prior to the exam). A list of acceptable calculators for closed book exams will be posted on the bulletin board across from the Department of Civil and Environmental Engineering Office: please be sure your calculator is on it! **Part marks may not be awarded for some of the problems on the final exam.**

3. Assignments:

There will be 3 assignments during the term. The purpose of the assignments is to help students in their assimilation and synthesis of the material, to develop their communication skills, and to prepare for the midterm and final. Assignment questions will consist of a mix of short answer and problem-based computational questions.

Assignments will be due electronically as a PDF through the course website; if completed by hand, then the assignment must be converted to a **very clear and legible PDF** for submission (instructions will be provided). Completion using software (Word, OneNote, XL, etc.) is ideal for easy conversion to PDF. Submission in any format other than a single PDF (unless otherwise indicated in the cover page of the assignment) will be assigned a mark of zero.

All written submissions will be passed through Turnitin to ensure no copying or plagiarism. You may discuss the assignments with colleagues but the work you turn in must be yours alone. Assignments are to be submitted prior to **11:55 pm on the due date**. Late assignments will be assessed a penalty of 10% per day, to a maximum of 4 days, after which they will receive a mark of zero. Request for extensions for legitimate reasons (e.g., sickness) must follow appropriate procedures; see "**Academic Consideration for Student Absence"** section below. **The maximum number of missed assignments for each student will be one;** if more than one assignment is missed a student may be barred from writing the final exam.

Tentative Assignment Schedule

Assignment	Published	Due	Returned
1	Sept 20	Oct 6	Oct 13
2	Oct 7	Oct 20	Nov 02
3	Nov 08	Nov 24	Dec 1

4. Project

A group research project will be assigned. Groups will be randomly assigned. The project runs throughout the course with a written and an oral deliverable. A component of peer review is included to ensure equal contribution from all group members. Full details provided in a separate document.

5. Participation

Participation is an important component of this course. It will be assessed in primarily three ways:

a) Attendance and verbal contribution during lectures and student presentations
b) Participation in the "test-your-learning" quizzes and polls using iClicker
c) Posting relevant, original, constructive material to the online discussion forums on the class website (both original posts and replies)

Information regarding iClicker Cloud
Classroom Polling

We will be using a cloud-based student response software by iClicker in class this semester. This will help me understand what you know, give everyone a chance to participate in class, and provide more interaction on concepts and example questions. We will also be using this software to keep track of attendance. At the start of every class you will JOIN my class; only after you do this will you be able to answer any poll questions posted. It does not matter if you answer right or wrong, there are no marks assigned for correctness. You only get marks for participating. Participating in the polls also, at the same time, registers your attendance. Participating in the majority of questions asked each day shows you were present in class that day.

You will need to create an iClicker Reef Student account to participate in class using your laptop, smart phone, or tablet connected to the university Wi-Fi.

Creating Your iClicker Reef Student Account

Go to iclicker.com/students or download the iClicker Reef Student app for your Apple or Android device to sign up for a Reef account. Those using the mobile app must have it updated to version 5.0.4 (Oct 2018) or newer. You should use your university email address and your University ID (e.g., "crobin69" for student crobin69@uwo.ca) in the Student ID field. You can edit your email address, password, or student ID from your account profile. Do not create and use more than one Reef account as you will only receive credit from a single account.

You do not need to purchase anything – iClicker Cloud is fully supported by Western and is free to all its students. Make sure you choose **Western University Ontario** when signing up.

Add This Course to Your Reef Account

- Use the + sign to search for my course in iClicker Reef.
- In the "Find Your Institution" field, enter **Western University Ontario**
- In the "Find Your Course" field, enter **CEE 2217 Intro to Environ Eng**
- Click "Add This Course" and it will be added to the main screen of your iClicker Reef account

Participating

- Each time our class meets, make sure you have selected my course from the main screen of your iClicker Reef account.
- When I start a session, click the **Join** button that appears on your screen, then answer each question I ask in iClicker Reef.
- For short answer and numeric questions, make sure you press **Send**.

Keep Track, Review, Study

- You can review your grades, performance, and participation in iClicker Reef

- You can use the questions I asked during class as flashcards or practice tests in the Study Tools section of iClicker Reef.

Academic Integrity Information
iClicker activities fall under the provisions of our campus academic honesty policy. Students must not engage in academic dishonesty while participating in iClicker activities. This includes but is not limited to:

- Checking in while not physically in class
- Having another student check you into class
- Answering polling questions while not physically in class
- Looking at other students' devices while answering live questions
- Using more than one iClicker remote or account at a time

Any student found to be in violation of these rules will lose polling points for the entire term and may be reported to the Dean of Engineering.

6. **Use of English:**

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

7. **Cheating:**

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.
For more information on scholastic offenses, please see:
http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

8. **Use of laptop computers, tablets or smart mobile phones.**

Use of laptop computers, tablets or smart mobile phones is expected to be for the purpose of participating in the lecture explicitly. They can be used to fill in the gapped notes, participate in class polls, and to register your attendance. Students using the devices for activities not related to this class may be asked to leave.

9. **Conduct:**

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Late comers may be asked to wait outside the classroom until being invited in by the Instructor. Please turn off your cell phone audio or motion notifications (calls, texts, alerts, etc) before coming to a class. Students are expected to participate in class discussions.

On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: https://www.uwo.ca/univsec/pdf/board/code.pdf

Course breakdown:

Natural Science = 35% = 22.05 AUs
Engineering Science = 40% = 25.2 AUs
Complementary Studies = 25% = 15.75 AU

STATEMENT ON GENDER-BASED AND SEXUAL VIOLENCE

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic relief will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services Office) that there are compelling medical or compassionate grounds that can be documented before academic relief will be considered. Different regulations apply to term tests, final examinations and late assignments. Please read the instructions carefully.

A. *GENERAL REGULATIONS & PROCEDURES*

1. All first-year students will report to the Undergraduate Services Office by submitting the Academic Consideration Request Form, for all instances.

2. If you are an upper year student and you are missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request Form. Absences worth LESS THAN 10% of your mark, will be processed by your department office. If your course work is worth 10% OR MORE of your final grade, your request will be processed by the Undergraduate Services Office.

3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.

4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.

5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. *TERM/MIDTERM TESTS*

1. If you are in first year and you are unable to write a midterm/term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.

2. If you are an upper year student and you are unable to write a midterm/term test, inform your instructor PRIOR to the scheduled date of the test and request relief through the Academic Consideration Request Form. If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, your request for relief will be processed by your department office. If the test is worth MORE THAN 10% of your final grade your request for relief will be processed by the Undergraduate Services Office.

3. Be prepared to attach supporting documentation to the Department Chair and/or the Undergraduate Services Office through the online form (see next page for information on documentation).

4. Discuss with the instructor if and when the test can be rescheduled. The approval of the Chair or the Undergraduate Services Office is required when rescheduling midterm/term tests.

C. *FINAL EXAMINATIONS*

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to report your absence using the Academic Consideration Request Form and request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.

3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must submit an "Application for a Special Exam" form. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

   PLEASE NOTE: **It is the student's responsibility to check the date, time and location of the Special Examination.**

D. *LATE ASSIGNMENTS*

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to submit the Academic Consideration Request Form and provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.
   ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

E. *SHORT ABSENCES*

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. *EXTENDED ABSENCES*

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You are strongly encouraged to seek advice from your Academic Counsellor in the Undergraduate Services Office.

G. *DOCUMENTATION*

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: **Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).**

H. *ACADEMIC CONCERNS*

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**

3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your Academic Counsellor.

Calendar References: Check these regulations in your 2023 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness:
https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_135
Academic Accommodations for Students with Disabilities:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_10
Academic Accommodations for Religious or Holy Days:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16
Course Withdrawals:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=6&SelectedCalendar=Live&ArchiveID=#Page_75
Examinations:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&command=showCategory&SelectedCalendar=Live&ArchiveID=
Scheduling of Term Assignments:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#SubHeading_78
Scholastic Offences:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_20
Student Medical Certificate:
https://www.eng.uwo.ca/files/undergraduate/student-medical-certificate.pdf
Engineering Academic Regulations:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=4&SelectedCalendar=Live&ArchiveID=#Page_86

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines:	First term half course (i.e. “A” or “F”)	September 15, 2023
	Full courses and full-year half course (i.e. “E”, “Y” or no suffix)	September 15, 2023
	Second term half course (i.e. “B” or “G”)	January 16, 2024
***Drop Deadlines*:**	First term half course without penalty (i.e. “A” or “F”)	November 13, 2023
	Full courses and full-year half courses without penalty (i.e. “E”,“Y” or no suffix)	November 30, 2023
	Second term half or second term full course without penalty (i.e. “B” or “G”)	March 7, 2024

Contact Information:

Undergraduate Services Office:	SEB 2097	Phone: 519-661-2130	E-mail: engugrad@uwo.ca
Chemical & Green Process Engineering:	TEB 477	Phone: 519-661-2131	E-mail: cbeugrad@uwo.ca
Civil Engineering:	SEB 3005	Phone: 519-661-2139	E-mail: civil@uwo.ca
Computer, Electrical, Mechatronic Systems & Software Engineering	TEB 279	Phone: 519-661-3758	E-mail: eceugrad@uwo.ca
Integrated Engineering	ACEB 2410	Phone: 519-661-6725	E-mail: engceli@uwo.ca
Mechanical Engineering:	SEB 3002	Phone: 519-661-4122	E-mail: mmeundergraduate@uwo.ca