Western University - Faculty of Engineering

Department of Civil and Environmental Engineering

CEE 2217a Introduction to Environmental Engineering
Course Outline 2016/17

This course introduces the basic engineering and science framework needed to understand and predict environmental processes and to appreciate the link between human activity and environmental sustainability. Main topics include population growth, resource consumption, sustainability, water chemistry, water pollutants, material balances, and air pollution. The course emphasizes role of the engineer in protecting human health and the environment. The course also touches on pressing environmental issues and their impact on society, including the role of engineers to impact public perception, policy and legislation. The course provides an introduction to a career in environmental engineering, but also provides concepts that are relevant to all civil engineering careers.

The general objectives are for the student to be able to:

- Identify key components of the physical environment and how they are influenced by human activity.
- Recognize how culture, societal factors and economics frame environmental issues.
- Apply the mathematics of growth to better understand population growth and sustainable yield at various scales.
- Use the mass balance equation to estimate pollutant concentrations in simple open and closed environmental systems.
- Apply fundamental principles of chemistry and physics to model the fate of pollutants in the environment (air and water).
- Improve communication and teamwork skills through undertaking individual written assignments, working on a group project, and delivering a group presentation.
- Acknowledge the need for life-long learning to keep abreast of emerging environmental issues and policies.

Calendar Copy:

A course introducing the application of chemistry and engineering principles to an understanding of environmental issues associated with human activity. Topics include mass and energy transfer, environmental chemistry, water and air pollution, pollutant transport modeling, pollution management, and risk assessment.

Contact Hours: 3 lecture hours and 2 tutorial hours each week; (recommended additional personal study - 3 hours).

Attendance to lectures and tutorial hours is **mandatory**.

Prerequisite: Chemistry 1024A/B

Corequisite: None

Antirequisite: CHEM2210A/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.

Instructor

Dr. Jason I. Gerhard, SEB3029, e-mail: jgerhard@.uwo.ca. Administrative Suppport SEB 3005

Textbook

Course notes (with gaps) will be available for download from the course website. These should be downloaded from the course website in advance of class and brought to class. The gaps will be filled in during class. Solutions to the problems discussed in class and tutorials as well as the gap-filled notes will not be posted on the course website. It is expected the solutions to these problems and information to fill the gaps will be recorded by the students during the lectures and tutorials.

Other References:

Gilbert M. Masters and Wendell P. Ela (2008). Introduction to Environmental Engineering and Science. 3rd Edition. Prentice Hall. 10 copies on 2-hr reserve in Taylor Library.

Units

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

Specific Learning Objectives

I. Analysis and Prediction of Growth (6 lecture hours)

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

(a) Manipulate the mathematics of growth and predict quantities using the concepts of half-life and exponential decay.

(b) Predict problems using continuous compounding with application to population growth and resource consumption.

(c) Define Sustainable Yield and calculate its value with respect to resource availability.

(d) Explain the concept of demographic transition in the context of population growth.

II Pollutants in the Environment: Water (12 lecture hours)

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

(a) Identify the basic physical and chemical properties of water.

(b) Recognize the major parts of the hydrologic cycle.

(c) Conduct calculations to describe pollutant concentrations in water.

(d) Apply key concepts of chemical ionic equilibrium to environmental aqueous systems.

(e) Calculate and predict the speciation of basic and acidic substances in water.

(f) Recognize the importance of the aqueous carbonate system in the environment.

(g) Model gas liquid chemical equilibrium in aqueous systems.

(h) Predict the behaviour and fate of pollutants in environmental water systems, such as pathogens, nutrients, heavy metals and pesticides.

(i) Identify the common chemical properties shared among organic pollutants.

(j) Understand the criteria used to describe water quality.

(k) Appreciate the social and geopolitical implications of water pollution, water shortages and water disparity.

III Materials Balances (8 lecture hours)

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

(a) Use appropriate units in calculating or measuring environmental quantities for liquids, gases and solids.

(b) Differentiate between conservative and non-conservative pollutants.

(c) Apply the principles of mass conservation to materials balances in simple steady-state and transient environmental systems, including pollutant decay.

III. Pollutants in the Environment: Air (8 lecture hours)

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

(a) Recognize the key physicochemical concepts used to describe air pollutants.

(b) Explain key air pollution problems such as ozone depletion, photochemical smog, and climate change.

(c) Understand the key societal and economic factors that influence the management of local, national and global air pollution.

(d) Recognize the basic chemical mechanisms that lead to ozone depletion.

(e) Appreciate the Montreal Protocol as an example of successful global partnership to reduce a targeted environmental threat.

(f) Understand global carbon emissions, carbon footprint and recent carbon trade schemes.

(g) Explain the majority scientific opinion surrounding global climate change and understand the importance of the topic in the future of the engineering profession.

(h) Develop an appreciation for the major impacts of global climate change and the dominant environmental, social, and economic systems that will be impacted.

General Learning Objectives

E=Evaluate, T=Teach, I=Introduce (*Beginner or Intermediate or Advanced Level*)

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

Evaluation

The final course mark will be determined as follows:

Participation	5%
Weekly Assignments:	15%
Midterm exam	15%
Project	15%
Final Examination	50%
Total	100%

Note: **(a) 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.

(b) 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 laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

(c) Should the midterm conflict with a religious holiday that a student wishes to observe, the student must inform the instructor of the conflict no later than two weeks before the scheduled test.

(For further information on Accommodations for Religious Holidays see http://www.uwo.ca/univsec/handbook/appeals/accommodation_religious.pdf)

1. Midterm Examination:

The midterm exam will be 2.0 hours on Wednesday November 2, 2:30 pm in SEB 2100.

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). 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 midterm or final exam.**

2. Weekly Assignments

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, like the exam questions, consist of a mix of short answer,

computations, and essay-style responses. There will be 4 assignments during the term. Assignments will be posted on the course website at 2 week intervals. They will be posted on Thursdays. The following Wednesday's tutorial will be dedicated to assisting students with the current assignment; students are encouraged to try the questions before coming to the tutorial. Assignments are due on the Tuesdays at 8:30am following the tutorial. All will be due electronically through the course website; if completed by hand, then it must be converted to a **very clear and legible** PDF for submission (see instructions online). Submission in incorrect format will be assigned a mark of zero. Late submission of assignments carries a penalty of 33% per day for 2 days. After 2 days (i.e., after Thursday 8:30am) the missing assignment will be marked zero. Extensions cannot be negotiated with the course instructor, nor the teaching assistants. Request for extensions for legitimate reasons (e.g., sickness) must be submitted to the UG services (SEB 2097) office where supporting documentation will be required. 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.

Assignment Schedule

Assignment	Published	Tutorial	Due	Returned
1	Sept 22	Sept 28	Oct 4	Oct 12
2	Oct 6	Oct 12	Oct 18	Oct 26
3	Oct 20	Oct 26	Nov 8	Nov 16
4	Nov 10	Nov 16	Nov 22	Nov 30

3. Project

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

4. Use of English

In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the 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.

5. Final Examination:

The midterm exam will be 3.0 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.**

SDC's Learning Skills Services

Rm 4100 WSS, www.sdc.uwo.ca/learning

LS counsellors are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Peer support is offered throughout the Fall/Winter terms in the drop-in PAL Centre, and Individual Counselling is available year round.

Plagiarism Checking:

All required papers or essay-style submissions may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com). For numerical submissions, teaching assistants will be checking for evidence of copying; excessive similarity between assignments will be taken as evidence of plagiarism at the discretion of the course instructor.

Scholastic Offences (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.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Attendance to the lectures and tutorials is mandatory and will be monitored. Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the

recommendation of the Department concerned, and with the permission of the Dean, the student will be barred from taking the final exam in the course.

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.

Accessibility:

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

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 before coming to a class, tutorial, midterm or exam. 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: http://www.uwo.ca/univsec/board/code.pdf

Sickness and Other Problems:

Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

See the attached "INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED"

There will be no make-up midterm exam nor assigments. If you are unable to write a test for medical or compassionate reasons, you must provide the appropriate documentation to the CEE Department Office (SEB 3005) office and upon recommendation from the UG service office the

weighting of the final exam will be adjusted accordingly. Failure to provide the adequate documentation will result in a mark of 0 for the missed exam/assigment.

Support Services

There is an abundance of support services to help you with virtually any type of challenge you may experience. Here are a few:

Registrarial Services http://www.registrar.uwo.ca

Student Support Services: http://westernusc.ca/services/

Emotional/Mental Health Support http://www.uwo.ca/uwocom/mentalhealth/

Or contact Undergraduate Student Services in Western Engineering, your Departmental Undergradaute Counsellor, or the Course Instructor. If you feel you need help of some kind, do not hesitate to reach out. We are all here to help you overcome challenges and be healthy and successful.

Notices

Students are responsible for regularly checking their email, course website (https://owl.uwo.ca) and notices posted outside the Civil and Environmental Engineering Department Office.

Consultation Hours

Students are encouraged to discuss problems with the teaching assistant and/or instructor during tutorial sessions. In between these times, students are encouraged to use the online forum on the website for discussing specific course material. Individual consultation may be arranged by appointment requested via email.

CEAB Course Breakdown

Engineering Science = 40%: 20.16 AUs
Basic Science = 35%: 17.64 AUs
Complementary Studies = 25%: 12.6 AUs
Total = 49.60 AUs

The document "INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED" is part of this course outline.

Western University
Faculty of Engineering
2016-2017

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 accommodation will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services office if you are in first year) that there are compelling medical or compassionate grounds that can be documented before academic accommodation will be considered. Different regulations apply to term tests, final examinations and late assignments. Read the instructions carefully. (see the 2016 Western Academic Calendar).

A. *GENERAL REGULATIONS & PROCEDURES*

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

2. Bring your request for academic accommodation to the attention of the Chair of the department (or the Undergraduate Services office if you are in first year) prior to the scheduled time of the test or final examination or due date of the assignment. If you are unable to contact the relevant person, leave a message with the appropriate department (or Undergraduate Services office, if you are in first year). The addresses, telephone and fax numbers are given at the end of these instructions. Documentation must be provided as soon as possible.

3. 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 exam reweighted on a retroactive basis is not permitted.

B. *TERM TESTS*

1. If you are unable to write a term test, inform your instructor and the Chair of your Department (or the Undergraduate Services Office if you are in first year) prior to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office and inform the Chair of the Department (or the Undergraduate Services Office if you are in first year).

2. Be prepared to provide supporting documentation to the Chair and the Undergraduate Services Office (see next page for information on documentation).

3. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair (or the Undergraduate Services Office if you are in first year) is required when rescheduling 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 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 (please spell your full name).

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, 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 sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. **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 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 Associate Dean 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. 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.

SHORT ABSENCES

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

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 may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

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 if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence.**

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).

ACADEMIC CONCERNS

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).

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.

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 2016 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness - page 117
Academic Accommodations for Students with Disabilities - page 118
Academic Accommodations for Religious Holidays - page 119
Incomplete Standing - page 104
Scheduling of Term Assignments – page 97
Scholastic Offences - page 113
Special Examinations - page 132

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.

***Drop Deadlines*:**		
	First term half course (i.e. “A” or “F”):	November 5, 2016
	Full courses and full-year half courses (i.e. “E”, “Y” or no suffix):	November 30, 2016
	Second term half or second term full course (i.e. “B” or “G”):	March 7, 2017

Undergraduate Services Office:	SEB	2097	telephone: (519) 661-2130	fax: (519) 661-3757
Dept. of Chemical and Biochemical Engineering:	TEB	477	telephone: (519) 661-2131	fax: (519) 661-3498
Dept. of Civil and Environmental Engineering:	SEB	3005	telephone: (519) 661-2139	fax: (519) 661-3779
Dept. of Electrical and Computer Engineering, Software Engineering Mechatronics Engineering	TEB	279	telephone: (519) 661-3758	fax: (519) 850-2436
Dept. of Mechanical and Materials Engineering:	SEB	3002	telephone: (519) 661-4122	fax: (519) 661-3020