Description
This course reviews the fundamental concepts of Sustainable Engineering and Life-Cycle Analysis. The general objectives are for the student to be aware of the environmental issues associated with industrial processes, environmental laws and regulations and to be able to evaluate and control the environmental footprint of an industrial chemical process.

Prerequisites
Third year status in the GPE Program.

Contact Hours
3 lecture hours, 0.5 course.

Instructor
Dr. P. Charpentier (CMLP 3303) Telephone: 519-661-2111 ext: 83466, email: pcharpen@uwo.ca

Undergraduate Assistant
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Recommended Text


Course Notes
Course notes will be available for download from the course website.

Reference Texts
None

Units
SI units will be used in lectures and examinations.
General Learning Objectives

| Knowledge Base | ✓ Individual Work | ✓ Ethics and Equity | ✓ |
| Problem Analysis | ✓ Team Work | ✓ Economics and Project Management |
| Investigation | Communication | ✓ Life-Long Learning |
| Design | ✓ Professionalism |
| Engineering Tools | ✓ Impact on Society |

Specific Learning Objectives

Introduction to environmental issues
At the end of this topic, students should:
- be able to identify the various types of environmental issues that can be associated with current industrial processes
- recognize waste and energy flows of industrial processes

Risk concepts
At the end of this topic, students should:
- know the various types of risks that can be associated with an industrial process
- Be able to identify exposure and dose-response relationships

Environmental law and regulations
At the end of this topic, students should:
- know the main environmental laws and regulations of Canada and the U.S. impacting industrial processes

Evaluating environmental fate
At the end of this topic, students should:
- be able to estimate environmental persistence and risks of industrially produced chemical compounds
- know the various methods used to estimate exposures to chemicals
- Be able to use methodologies for designing safer chemicals

Evaluating environmental performance during process synthesis
At the end of this topic, students should:
- be able to estimate the environmental performance of a process at various stages of process development
- be able to evaluate the environmental costs of a process
Lifecycle concepts
At the end of this topic, students should:
• know how to predict the life-cycle of products and processes
• be able to analyze a process flowsheet to determine how it could be modified to minimize the environmental footprint of the process
• be able to quantify the impacts of a process on the environment

Industrial ecology
At the end of this topic, students should:
• know how to evaluate the environmental performance of a process by considering how it integrates with other processes and material flows

Evaluation
The final course mark will be determined as follows:

- Assignments: 20%
- Mid-Term Examination: 20%
- Project: 20%
- Final Examination: 40%

The midterm exam will be a 2-hour exam while the final exam is a 3-hour exam covering all aspects of the course. A one-sided “cheat” sheet can be used for the midterm exam while the final exam can use both sides.

Note
1) **Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned 48% if the aggregate mark is higher than 50%, or the aggregate mark.
2) Assignments are to be handed into GPE 3382A locker (#449) located in TEB on the specified due date provided by the Instructor.

Repeating All Components of the Course
In accordance with Senate and Faculty Policy, students who have failed an Engineering course (i.e. <50%) 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 for grading by the student in subsequent years.

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 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.
**Attendance**

Attendance in lectures, tutorials and labs is mandatory. 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 debarred from taking the regular examination in the course.

**Cheating**

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning (see Scholastic Offence Policy in the Western Academic Calendar).

**Plagiarism**

Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

The University of Western Ontario has software for plagiarism checking. Students may be required to submit their work in electronic form for plagiarism checking.

**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.

**Sickness and Other Problems**

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

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.

**Notice**

Students are responsible for regularly checking their Western email and notices posted on Instructors' doors.
Consultation
Students are encouraged to discuss problems with their teaching assistant and/or instructor in tutorial sessions. Office hours will be arranged for the students to see the instructor and teaching assistants. Other individual consultation can be arranged by appointment with the appropriate instructor.

Accreditation (AU) Breakdown
Engineering Science     =  70%
Complementary Studies  =  30%

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