1 INSTRUCTOR

Instructor: Khosrow Farahbakhsh, Ph.D., P.Eng. (School of Engineering)
Office: RICH 3515, ext. 53832
Email: khosrowf@uoguelph.ca
Office hours: By appointment

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*6790 Courselink site. You are responsible for checking the site regularly.

2.2 Required Textbook

There is no required textbook for this course. The instructor will provide weekly reading materials related to specific lecture topics. All students are expected to study the assigned readings prior to each lecture.

2.3 Recommended Resources

Recommended resources will be posted on Courselink.
2.4 Additional Resources

Lecture Information: The lectures will be a combination of Powerpoint slides and notes on the whiteboard. All the lecture slides will be posted on the Courselink (week #1-#12).

Assigned work: Download the assigned work on the Courselink according to the schedule provided in the class.

3 ASSESSMENT

3.1 Dates and Distribution

P2 Case Study Presentations (individual presentations) 15%
Reflective Journals (based on course assigned readings) 15%
Pollution prevention and sustainable engineering assignments 30%
Individual Pollution Prevention Project 15%
Final Exam 25%

The minimum passing grade is 65%.

CASE STUDY PRESENTATIONS
Each student will present a case study of an existing pollution prevention and sustainable engineering project including design philosophy, drivers, methodology and outcome. Each student will make one presentation during the class with presentations distributed throughout the semester. More details will be provided in the class. Case studies must be approved by the instructor at least three days prior to each presentation.

REFLECTIVE JOURNALS
This is a reflective journal written in a paper style. Each student will write a paper (details to be provided) describing her/his learning in the course using the reading materials assigned and class discussion. Each journal entry must not exceed 300 words. Individual journal entries are due on a weekly basis. At the end of the course, each student will submit a paper comprised of all journal entries. More detail on journaling and the final paper will be provided at the class.

POLLUTION PREVENTION AND SUSTAINABLE ENGINEERING ASSIGNMENTS
Teams of two to three students will tackle a total of three pollution prevention assignments. Teams will be changed for each assignment. These assignments will introduce the students to various aspects of pollution prevention analysis and reporting. More detail will be provided during the lectures.
INDIVIDUAL POLLUTION PREVENTION PROJECT

Each student will conduct a systematic personal pollution prevention analysis involving energy and material balance of their own everyday life and prepare a personal pollution prevention report. More detail will be provided during the course. The due date for the individual project is July 13, 2015.

FINAL EXAM

There will be a written final exam on July 30, from 9:30 to 11:30. The final exam will over all materials covered in the course.

3.2 Course Grading Policies

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration:

https://www.uoguelph.ca/registrar/calendars/graduate/2014-2015/genreg/sec_d0e1810.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

4 AIMS & OBJECTIVES

4.1 Suggested Calendar Description

Pollution prevention is a proactive approach to environmental management for minimizing or preventing the generation of pollutants at the source. Pollution prevention is an important element of sustainable engineering that promotes efficient use of resources and minimizes negative human impact on the natural environment.

4.2 Course Aims

This course aims to:

1. Introduce students to the pollution prevention concepts, policies, procedures and practices
2. Enable students to conduct pollution prevention audits and develop pollution prevention plans
3. Present various concepts related to sustainability and sustainable engineering theories and practices
4. Provide students with adequate theoretical background to effectively and critically analyse strategies and engineering solutions in terms of their degree of sustainability

5. Provide students with various tools for conducting pollution prevention and sustainable design such as pinch analysis, material and energy flow analysis, systems analysis (causal loops, stock & flow diagrams, etc.)

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Conduct pollution prevention audits and develop pollution prevention plans
2. Effectively prioritize pollution prevention strategies and develop implementation plans
3. Apply the basic concepts of science such as the laws of thermodynamics to understanding of sustainability and sustainable engineering
4. Apply various concepts of sustainable engineering to assess and critically evaluate the long-term sustainability of proposed engineering solutions

4.4 Instructor’s Role and Responsibility to Students

The instructor’s role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink/D2L but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.5 Students’ Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

E-mail Communication: All students are required to check their University of Guelph e-mail account regularly. E-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration:

https://www.uoguelph.ca/registrar/calendars/graduate/2014-2015/genreg/sec_d0e1810.shtml

Drop Date: The last date to drop one-semester courses, without academic penalty, is Friday, July 3. Two-semester courses must be dropped by the last day of the add period in the second semester. Refer to the Graduate Calendar for the Schedule of Dates.
Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

4.6 Relationships with other Courses

Previous Courses: This course may relate to a number of graduate courses the students may have already taken including those dealing with sustainability, water and wastewater management, renewable energy and emission monitoring and control.

Follow-on Courses: None

5 Teaching and Learning Activities

5.1 Timetable

Lectures:

Lectures will be conducted at Rm. 3527, Richards Building on Thursdays from 9:00 am to 11:50 am.

5.2 Course Topics and Schedule

Please note that the outline below is for reference purposes only. Other topics will be introduced as deemed necessary by the instructor or students.

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Topics</th>
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<tbody>
<tr>
<td>Lecture 1</td>
<td>History of pollution prevention, cleaner production and sustainable design</td>
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<tr>
<td>Lectures 2 – 6</td>
<td>Sustainability in the context of the science</td>
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<tr>
<td></td>
<td>a. The First and Second Laws of Thermodynamics, exergy, Second Law efficiency</td>
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<td>b. Related concepts from Quantum mechanics</td>
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<td>c. Complexity theory, complex dynamic systems</td>
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<td>d. Introduction to Chaos and uncertainty</td>
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<td>e. Systems thinking</td>
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<td>f. Ecological engineering</td>
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<td>g. Industrial ecology</td>
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<td>h. Resilience, fitness and adaptation</td>
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<tr>
<td>Lectures 7 – 9</td>
<td>Tools for conducting pollution prevention</td>
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</tbody>
</table>
a. Material and energy flow analysis
b. Benchmarking
c. Developing process maps
d. Identifying and ranking options
e. Cost-benefit analysis
f. Pinch analysis

Lectures 10 -11

Strategies for implementing P2 and sustainable engineering
a. Environmental management system
b. Participatory design, total design
c. Introduction to tools for workers’ engagement and participation

Lecture 12

Course review

5.3 Other Important Dates

Drop Date: The last date to drop one-semester courses, without academic penalty, is July 3, 2015. Refer to the Graduate Calendar for the schedule of dates: http://www.uoguelph.ca/registrar/calendars/graduate/current/

6 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. The Academic Misconduct Policy is detailed in the Graduate Calendar: http://www.uoguelph.ca/registrar/calendars/graduate/current/
7.1 Resources

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

The Graduate Calendar is the source of information about the University of Guelph’s procedures, policies and regulations which apply to graduate programs:
http://www.uoguelph.ca/registrar/calendars/graduate/current/