ENGINEERING 9630: Pollution Prevention

Instructor: Cynthia Coles
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Phone: 864-8704
Office Location: EN-3004
Office Hours: Mon., Thurs., 12:30-1:30 p.m. and by appointment
Website: http://www.engr.mun.ca/~ccoles/
Communication: Email is best.

COURSE DESCRIPTION:

Contaminant sources, characteristics and fate, impacts of industrial activities, development and improvement of manufacturing processes, life cycle assessment of processes, sustainable ethics and economics, financial incentives, fossil fuels use reduction through divestment and revenue-neutral carbon tax, pollution prevention (P2) planning alternatives, design for after life, conservation of rinse water flows and pinch analysis, managing residuals and estimating and controlling fugitive emissions, sustainable society, industrial ecology, and circular economy

SCHEDULE:

LECTURE: Mon., Wed., 2:00 – 3:15 p.m. in EN 4008

CREDIT VALUE:

3 credits

RESOURCES:

TEXT BOOKS

REFERENCES FOR FOSSIL FUEL DIVESTMENT
- Rusbridger, A., 2015, Scientists must speak up on fossil-fuel divestment, Nature, 520:265..
- Jacqz, H., 2015, Henry Jacqz: A student of climate change, Bulletin of the Atomic Scientists,
REFERENCE FOR ETHICAL CHALLENGES


MAJOR TOPICS:

- Introduction to P2, properties of contaminants, contaminant concentrations, contaminant transport processes, partitioning, and transformation (Ch. 1 and 2)
- Industrial activities and the environment, air pollution, solid wastes and their management, hazardous wastes, energy use (Ch. 3)
- Improvements to manufacturing, batch flow and continuous flow chemical reactors, heat exchange, evaporation and drying, crystallization, distillation, absorption/stripping, extraction/leaching, and adsorption processes, process development and design improvements (Ch. 5)
- Life cycle assessment, life cycle impact assessment phases and applications, (Ch. 6), P2 economics, regulations, and financial incentives, engineering economics (Ch. 7)
- Ethical challenges, sustainable ethics and economics, terminology, measures to reduce GHG emissions, fossil fuel divestment, revenue-neutral carbon tax (Ch. 1 and other references)
- P2 planning, P2 design, green chemistry, alternative synthetic pathways, alternative reaction conditions, design of safer chemicals, design for disassembly and de-manufacturing, packaging (Ch. 8 and 9)
- Water, energy and reagent conservation, rinse water flow analysis examples, pinch analysis examples (Ch. 10)
- Residuals management, wastewater treatment processes, sludge management, air pollution control measures, gas removal (Ch. 11)
- Fugitive emissions, measuring fugitive emissions, controlling fugitive emissions, fugitive emissions from storage tanks (Ch. 12)
- Sustainable society, brief history and highlights, framework for sustainability, industrial ecology, sustainability of selected minerals, gold, platinum group metals, phosphorus (Ch. 14 and other references)

LEARNING OUTCOMES:

Upon successful completion of ENGI 9630, the student will be able to:

1. Appreciate introductory contaminant characteristics, fate and transport.
2. Understand aspects of industrial waste production and energy consumption.
3. Evaluate and improve some manufacturing processes.
4. Understand the roles of economics and ethics related to pollution prevention.
5. Perform simple present cost calculations.
6. Select better design and conservation strategies.
7. Propose treatment measures for industrial wastes.
8. Prepare a strategy for reducing fugitive emissions.
9. Identify and use valid sources of information and proficiently communicate technical information in writing and verbally.

**ASSESSMENT:**

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<tr>
<th>Task</th>
<th>Weight</th>
<th>Due Dates</th>
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<tr>
<td>Paper</td>
<td>30%</td>
<td>Monday, February 13 at noon</td>
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<tr>
<td>Presentation</td>
<td>20%</td>
<td>Monday, March 20 and 27</td>
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<td>Three assignments in class</td>
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<td>Mon., Jan. 30 and Mar. 6, and Wed. Mar. 15</td>
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<td>Midterm test</td>
<td>15%</td>
<td>Monday, February 27</td>
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<td>Final exam</td>
<td>20%</td>
<td>April 10 – 20</td>
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**Proposed Due Dates**

The midterm test and final exam will be open book for numerical calculations and closed book for theoretical questions. Scientific calculators only are permitted. The electronic PowerPoint Presentation is to be received by the Professor a few hours before the class presentation. The final exam could be moved by bad weather.

In class, personal laptops, phones and any other electronic devices should be turned off with the exception that phones may be used to photograph figures and tables from the class notes.

The first and second assignments will be from the two below journals papers and the third assignment will be given by a guest lecturer and related to a circular economy.


**ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:**

The highest level of academic integrity is expected from students. Please consult Memorial University’s Code of Student Conduct at [http://www.mun.ca/student/conduct](http://www.mun.ca/student/conduct). Any student found to commit an academic offence will be dealt with according to the practices as outlined by Memorial University. The related calendar information is available at [http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748](http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748)

**INCLUSION AND EQUITY:**

Students requiring physical or academic accommodations may speak confidentially to the
instructor so that appropriate arrangements can be made. Diversity of viewpoints, values, and backgrounds that each class participant possesses enrich the university experience. Insightful and comprehensive class discussion will be possible when dialogue is collegial and respectful.

**STUDENT ASSISTANCE:** Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at [www.mun.ca/student](http://www.mun.ca/student). A specific resource is the Writing Centre at [http://www.mun.ca/writingcentre/about/](http://www.mun.ca/writingcentre/about/).

**ADDITIONAL INFORMATION:**

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Engi 9605: Water and Wastewater Treatment
Engi 9630: Pollution Prevention