School of Science

# ENVS 101

## Introduction to Environmental Science 2

**Winter 2021**

**3 Credits**

# Course Outline

**INSTRUCTOR:** Scott Gilbert, BSc., Ph.D.

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**OFFICE HOURS:** Mon/ Wed 9:15-10:15 or other times by request (using email).

**LECTURE:** Mon / Wed 10:30 -noon **Room**: A2103 **Dates:** Sept. 8 – Dec 6
**LAB:** Thurs **Room:** A2103 **Dates:** Sept. 9 – Dec 2

**COURSE DESCRIPTION**

Environmental Science 101 is a companion course to ENVS 100; it is designed for students who are not pursuing a science program but who wish to learn more about the effects of human activities on the environment. Students will be able to apply the basic concepts that were presented in ENVS 100 to investigate a variety of environmental problems at both the local and global level.
There will be four major units in this course. Firstly, energy supply options and the relative impacts of these options on the environment. With changing global energy economies, considering options for reducing dependence on certain energy types in order to lessen additions to global climate feedbacks is an increasingly integral challenge to northern lifestyles. Secondly, an introduction to basic concepts of organic chemistry and how contaminants such as DDT and PCB's have impacted northern ecosystems. Thirdly, the importance of the water cycle and groundwater, as well as problems of water pollution from domestic agriculture and industrial sources. And lastly, the practical aspects of environmental protection and an introduction to conservation biology and environmental regulation.

**PREREQUISITES**

Admission to an academic program within the School of Science or School of Liberal Arts.

**RELATED COURSE REQUIREMENTS**

Lectures during Winter 2022 are planned as online for week 1(Jan. 4-7) and then face to face classes while labs will be face to face.

**EQUIVALENCY OR TRANSFERABILITY**

SFU SFU GEOG 1XX (3), Physical A
TRU TRU BIOL 1XXX (3)
UAS Physical Geog Elec (3)
UBC UBC GEOG 1st (3). Not for credit in Science
UR Geog 200 (3)
UVIC UVIC ES 1XX (1.5)

See https://bctransferguide.ca/ for an up to date list of transfers within BC. Further information and assistance with transfers may be available from the School of Science.

**LEARNING OUTCOMES**

Upon successful completion of the course, students will be able to:

- Use library resources to research and critically assess an environmental topic.
- Write a basic scientific report to describe the outcome of a field or laboratory study using a standard format of Introduction, Methods, Results and Discussion.
- Name simple organic molecules, describe the combustion reaction of alkanes, recognize functional groups and isomers, and understand the structural aspects of PCB's that influence their toxicity.
- Develop a simple cost-benefit analysis of energy-conservation related proposal including a matrix that lists relevant externalities.
- Summarize the range of issues surrounding an environmental question including ethical perspectives, questions of sustainability and underlying biological and chemical factors.

**COURSE FORMAT**

**Lectures:** Three hours per week (2 classes of 1.5 hours, face to face). Efforts will be made to record and post the Zoom lectures online after class but students should participate in each class rather than relying on the video archive.

**Labs:** Three hours per week, face to face, with physical distancing as required. Activities vary and will include chemistry lab demonstrations, tutorials on problem sets, guest lectures and class presentations.

**ASSESSMENTS:**

**Attendance & Participation**

Students are expected to attend both lectures and the scheduled activities (including field activities). Several of the lab exercises involve collecting data or making observations and this would make it difficult or impossible for students who miss the lab to complete the lab assignment. There is a strong correlation between regular attendance and academic performance.

**Assignments**

There will be weekly short take-home assignments and the field/lab activities involve written assignments. Students must pass the field/lab portion of the course to receive a passing grade for the overall course. A book review exercise will be assigned early in the term.

There will be several short class quizzes and take home assignments and some field/lab activities may require written assignments. Students must pass the lab portion of the course if they wish to receive a passing grade for the overall course.

**Tests**

Rather than a mid-term examination we will have a short test at the end of three of the modules. The final exam will be comprehensive and cover all topics taken up during the term.

**EVALUATION:**

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|---|---|
| Short in-class quizzes | 5% |
| Take home readings & questions | 11% |
| Field / lab exercises | 25% |
| Quiz (3 modules 8% each) | 24% |
| Term paper | 15% |
| Final Exam | 20% |
| **Total** | 100% |

**REQUIRED TEXTBOOKS AND MATERIAL**

Freedman, Bill. 2018. *Environmental Science: A Canadian Perspective*. 6th Edition The text is available as a free download in various formats under a Creative Commons licence. See: https://digitaleditions.library.dal.ca/environmentalscience/

Flowers,P., Theopold, K., Lanley, R. & Robinson, W. 2019 – *Chemistry.* Chapter 20 will be provided on our course website. Also available: https://openstax.org/details/books/chemistry

Weekly lab activities and additional readings will be available on the course web site.

**ACADEMIC AND STUDENT CONDUCT**

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

**PLAGIARISM**

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

**YUKON FIRST NATIONS CORE COMPETENCY**

Yukon University recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon University program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukonu.ca/yfnccr.

**ACADEMIC ACCOMMODATION**

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

**TOPIC OUTLINE**

| Date | Lect | Topic |
|---|---|---|
| Jan. 5 | 1 | Term overview. Environmental Health & Toxicology **Readings:** pp 576-587 |
| **Module I - Organic Chemistry** | | |
| Jan. 10 | 2 | Chemistry review: ionic and covalent bonds. Why such diversity of carbon compounds? Introduction to alkanes, alkenes, alkynes, cycloalkanes |
| Jan. 12 | 3 | Combustion of alkanes & balancing equations **Readings:** pp 602-603 |
| Jan. 17 | 4 | Isomers |
| Jan. 19 | 5 | Benzene, functional groups |
| Jan. 24 | 6 | PCB's - structure and toxicity; chiral compounds and stereochemistry |
| Jan. 26 | 7 | Contaminants in the North - Arsenic trioxide in Yellowknife; Video: *Shadow of a Giant* **Readings:** pp 219, 338 |
| **Module II - Energy** | | |
| Jan. 31 | 8 | Introduction to externalities |
| Feb. 2 | 9 | Introduction to cost-benefit analyses |
| Feb. 7 | 10 | What is energy? Units of measurement. Overview of renewable and non-renewable energy sources **Readings**: Chap 13 |
| Feb. 9 | 11 | **Readings:** pp 75-77 /Energy choices: Soft versus hard path; **Readings:** pp 314-315; 609-610 |
| Feb. 14 | 12 | Yukon Wind Energy – History and Future Prospects (Kate Ballegooyen) |
| Feb. 16 | 13 | Nuclear Energy – Small Modular Reactors |
| Feb. 21 -24 | | Reading Week - Feb 21-24 includes Friday holiday for Heritage Day on Feb 25 |
| Feb 28 | 14 | Overview of systems analysis and feedback loops in natural systems; Governance and energy policy primer; Hydraulic Fracturing |
| Mar. 2 | 15 | Carbon capture and sequestration, geoengineering **Readings:** pp 464-465 |
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| **Module III – Water** | | |
| March 7 | 16 | Chemical properties of water Chapter 1[1] in *Northern Waters*, **Text** Chapter 9 |
| | | **Module III – Water (continued)** |
| March 9 | 17 | Water pollution – Chapter 7 in *Northern Waters* **Readings:** pp 596; 604-608 |
| March 14 | 18 | Groundwater resources and threats |
| March 16 | 19 | Surface water resources and eutrophication **Readings:** Chapter 9, p. 272 |
| March 21 | 20 | Eutrophication (continued); Video: *Save My Lake* |
| **Module IV - Environmental Regulation** | | |
| March 23 | 21 | Sustainability: do we need more regulations? **Readings:** Chapter 18 |
| March 28 | 22 | Tools to encourage compliance with environmental regulations |
| March 30 | 23 | Tools … continued; |
| April 4 | 24 | Intro to Ecological Economics |
| April 6 | 25 | Island biogeography and preserving biodiversity **Readings:** Chapter 7 |
| April 11 | 26 | Final Summary Lecture |

**Schedule of Lab Activities**

| **Thursdays** | **Topic** |
|---|---|
| Jan. 6 | McIntyre Ck Biodiversity – track transects on snowshoes (-25°C cut-off temperature) |
| Jan. 13 | Heat Loss of Winter Footwear Energy + Organic Chemistry Tutorial I |
| Jan. 20 | Organic Chemistry Tutorial II |
| Jan. 27 | Organic Chemistry Tutorial III + Solubility demonstration in Chemistry Lab |
| Feb. 3 | *Quiz: Organic Chemistry* - 60 minutes - Chemical Fact Sheet due today – Intro to cost-benefit calculation exercise |
| Feb. 10 | Energy conservation tutorial |
| Feb. 17 | Sustainability workshop with Rachel Pugh from Yukon Research Centre |
| Feb 24 | Reading Week Break |
| March 3 | *Quiz: Energy* - 45 minutes // Class presentations on term paper progress |
| March 10 | Group Presentations on Yukon Energy Supply Options |
| March 17 | Field trip Water Quality Lab (to be confirmed) |
| March 24 | Water lab – quantitative exercise |
| March 31 | *Quiz: Water* (45 minutes) |
| April 7 | Island biogeography workshop |

1 Readings from *Northern Waters: A Guide to Designing and Conducting Water Quality Monitoring in Northern Canada*. 2005. EMAN-North