

COURSE SYLLABUS



COURSE TITLE: CHEM-253: Environmental Chemistry

CLASS SECTION: 001

TERM: Winter 2022

COURSE CREDITS: 4

DELIVERY METHOD(S): In person

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

For COVID-19 information please visit <https://legacy.camosun.ca/covid19/index.html>

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Neil Meanwell

EMAIL: meanwen@camosun.bc.ca

OFFICE: F 348B

HOURS: Mon, Tues, Wed, Thurs: 11.30 am -12.30 pm; Fri:1.30 pm – 2.30 pm. They will be given online using Blackboard Collaborate. In person meetings should be made by appointment.

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

Designed for students in the Environmental Technology program, Topics include: chemical toxicity, chemistry of the atmosphere and aquatic systems, organic and inorganic contaminants in the environment, and associated chemical instrumentation. Emphasis will be on laboratory work which will give students an introduction to chemical instrumentation and methodology.

PREREQUISITE(S):

All of:

- CHEM 121

CO-REQUISITE(S):

EXCLUSION(S):

COURSE LEARNING OUTCOMES / OBJECTIVES

Upon completion of this course a student will be able to:

1. Describe the natural physical and chemical processes that occur in the environment, especially those pertaining to the atmosphere and the hydrosphere.
2. Use the specialized language and terminology of environmental chemistry.
3. Describe the effects of human activity upon the environment and comment on the properties of specific organic and inorganic pollutants.
4. Utilise the knowledge of the chemical and physical properties of substances to determine how various pollutants exert their effects on the environment both qualitatively and quantitatively.
5. Classify hazardous substances according to their properties and describe the approaches to their safe disposal.
6. Classify toxic substances according to type and use the terminology associated with chemical toxicology.
7. Perform numerous laboratory procedures involving the monitoring of various pollutants in the environment.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

- (a) Textbook: Environmental Chemistry, 5th Edition, Colin Baird and Michael Cann, Freeman
- (b) Chem 253 Lab Manual, In-house – available as an electronic version on D2L
- (c) Safety glasses and laboratory coat

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

- (a) Scheduled lectures: Tues and Thurs, 10.00 am to 11.20 am, E 344

Brief Summary of Course Material

1. General Introduction (supplemented with handouts) (1 lecture) Common terminology, biosphere, hydrosphere, lithosphere, atmosphere, anthrosphere, energy and energy cycles, matter and matter cycles, humans and pollution.

2. The Chemistry of Natural Waters (Chapter 10) (6 lectures) Properties of water, hydrologic cycle, oxidation-reduction chemistry in natural waters, solubility of oxygen in water, Henry's law, oxygen demand, chemical and biochemical oxygen demand, anaerobic decomposition of organic matter, aerobic and anaerobic conditions, pE scale, sulphur and nitrogen compounds in water, acid mine drainage. Acid-base chemistry in natural waters - the carbonate system, water in equilibrium with calcium carbonate, water in equilibrium with carbon dioxide, water in equilibrium with calcium carbonate and carbon dioxide, measured ion concentrations in natural waters and drinking water, alkalinity and acidity, hardness index for natural waters, aluminum, metal complexation, other chemical species in water.

3. Toxic Organic Chemicals (Chapters 13, 14, and 15) (2 lectures) Pesticides including herbicides and insecticides, organochlorine compounds, principles of toxicology, dose-response relationships, other types of modern insecticides, herbicides. Other notable organic pollutants including dioxins, PCBs, and polynuclear aromatic hydrocarbons (PAHs). Long range transport of atmospheric pollutants.

4. Toxic Heavy Metals (Chapter 12) (2 lectures) General features of heavy metals and their toxicity, bioaccumulation of heavy metals. Mercury, lead, cadmium, and arsenic.

5. The Purification of Polluted Water (Chapter 11) (2 lectures) Contamination of groundwater, purification of drinking water, methods of disinfection. Treatment of wastewater and sewage. Modern wastewater purification techniques.

6. Principles of Atmospheric Chemistry (Parts of Chapters 1, 2, 3, 4, and 5) (2 lectures) Composition of the atmosphere, regions of the atmosphere, variation of atmospheric pressure with altitude, electromagnetic spectrum, fate of solar radiation, principles of photochemistry, atmospheric concentration units, kinetics of atmospheric reactions, radicals, excited states, and ions. Principles of reactivity of important atmospheric species.

7. Topics in Atmospheric Pollution (Parts of Chapters 1, 2, 3, 4, and 5) (5 lectures) Topics to be covered in detail include ozone layer depletion, photochemical smog, acid rain, and climate change.

8. Particles in the Atmosphere (Chapter 4) (2 lectures) Description and importance of atmospheric particles, physical characteristics, energy and mass transfer, basic chemical reactions in the atmosphere. Physical behaviour of particles in the atmosphere, Stokes's law, physical and chemical processes of particle formation, types of particles and their effects, Air Quality Index, PM index. Indoor air pollution.

9. Hazardous Waste (Chapter 16) (2 lectures) The nature of hazardous wastes, ignitability, corrosivity, reactivity, toxicity. Hazardous compounds and their classification, chemical classification of hazardous wastes. Radioactive waste.

10. Renewable Energy, Alternative Fuels, and the Hydrogen Economy (Chapter 8) (2 lectures) Renewable energy, alternative fuels, hydrogen as a fuel.

(b) Scheduled labs: Wed, 12.30 pm to 3.20 pm, F 356

Laboratory Schedule Winter 2022

Week # (date)	Experiment
1. (12 th January)	Safety Talk/Lecture
2. (19 th January)	#1 Statistical Treatment of Data and the Measurement of Some Physical Properties of Natural Waters (Report due: 26 th January)
3. (26 th January)	#2 The Measurement of Dissolved Oxygen in Natural Waters (Report due: 2 nd February)
4. (2 nd February)	#3 The Determination of Orthophosphate in Water (Report due: 9 th February)
5. (9 th February)	#4 Alkalinity and the Carbonate System (Report due: 23 rd February)
6. (16 th February)	No Lab – Term Test 1
7. (23 rd February)	No Lab – Reading Break
8. (2 nd March)	#5 The BOD/COD of Polluted Water (Report due: 9 th March)
9. (9 th March)	#6 Determination of Fluoride using an Ion-Selective Electrode (Report due: 16 th March)
10. (16 th March)	#7 The Conductivity of Natural Waters (Report due: 23 rd March)
11. (23 rd March)	#8 Introduction to Gas Chromatography (Report due: 6 th April)
12. (30 th March)	No Lab – Term Test 2
13. (6 th April)	#9 Determination of Heavy Metals Using Atomic Absorption Spectrophotometry (Report due: 13 th April)
14. (13 th April)	No Lab – Lecture/Review

(c) Review assignment on first year chemistry topics. The assignment will be taken in for marking before the first midterm

(d) Assignments: Assignment questions will be distributed periodically to keep pace with the course material. The questions will be chosen from the questions given at the end of each chapter of the textbook. Some additional questions will also be given. The assignments will **not** be taken in for marking. Solutions will be periodically posted on D2L in PDF format.

(e) Term Tests: You will be required to take the following term tests:

Term Test 1 Week 6 - 120 minutes duration. Written exam on the lecture material presented from Week 1 to Week 5 of the course. Scheduled for the lab period of Week 6.

Term Test 2 Week 12 - 120 minutes duration. Written exam on the lecture material presented from Week 6 to Week 11 of the course. Scheduled for the lab period of Week 12.

(g) Final Exam: A three-hour written exam on **all** the lecture material presented in the course. Scheduled for the week immediately following the end of the semester.

Note: Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced noticed is required. Deadlines scan be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Review Assignment	5%
Term Test 1	15%
Term Test 2	15%
Laboratory Work	30%
Final Exam	35%
	TOTAL
	100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

COURSE GUIDELINES & EXPECTATIONS

- a. Students **must** attend the first laboratory meeting which is on safety in the laboratory and general laboratory procedure.
- b. You must wear safety glasses and a laboratory coat at all times while an experiment is in progress. You will not be allowed to perform an experiment if you are not wearing the required safety equipment.
- c. If you **miss an experiment** you will be given a mark of **zero** for the experiment unless you have a valid medical reason or family emergency, in which case supporting documentation must be supplied.
- d. You must submit a minimum of **SEVEN laboratory reports** in order to obtain a passing mark for the laboratory portion of the course.
- e. You **must pass both the lecture and laboratory** portions of the course separately in order to obtain a passing grade overall.
- f. If you miss a term test the weighting from that test will be transferred to the final exam. The only exception will be for a valid medical problem or family emergency, in which case supporting documentation must be supplied and an alternative test will be arranged.

g. If it is advantageous to the student, if either, or both, the term test marks are inferior to the final exam mark, the weighting will be replaced by an equal weighting from the final exam.

h. Late submissions of laboratory reports and/or assignments will be penalized and none accepted if more than **seven days** past the deadline.

SCHOOL OR DEPARTMENTAL INFORMATION

The following is a link to the Science Help Centre:

<https://camosun.ca/services/academic-support/help-centres/science-help-centres>

The Science Help Centre hours will be posted on notice boards around the Department soon.

Chemistry and Geoscience also has a study room adjacent to the F 356 laboratory equipped with networked computers and a printer. It is a great place to study with fellow chemistry students.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills

Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the “Attendance” section under “Registration Policies and Procedures” (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun’s Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student’s right to choose what is right for them. For more information see Camosun’s Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-3703841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College’s Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College’s expectations of academic integrity and student behavioural conduct.

Changes to this syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.