

COURSE SYLLABUS



COURSE TITLE: CHEM 253 (Environmental Chemistry)

CLASS SECTION: 001

TERM: Winter 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): Lecture and laboratory

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 updates please visit <https://camosun.ca/about/covid-19-updates>.

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-Thurs, 1.30 - 2.30 pm; Thurs, 11.30 am – 12.30 pm.

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): C in CHEM 121 - Must be completed prior to taking this course.

CO-REQUISITE(S): None

EQUIVALENCIES: None

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

(a) Scheduled lectures: Tues and Thurs (F 200), 9.30 am to 10.50 am

WEEK	ACTIVITY or TOPIC	NOTES
1	General Introduction: Common terminology, biosphere, hydrosphere, lithosphere, atmosphere, anthrosphere, energy and energy cycles, matter and matter cycles, humans and pollution. The Chemistry of Natural Waters (6 lectures) Properties of water, hydrologic cycle, solubility of oxygen in water, Henry's law, oxygen demand	Chapter 10
2	Acid-base chemistry in natural waters, pH and carbon dioxide, the carbonate system and pH, alkalinity and acidity.	Chapter 10
3	Oxidation-reduction chemistry in natural waters, oxidation numbers and redox, aerobic/anaerobic, Nernst equation, pE scale, pE calculations.	Chapter 10
4	pH/pE diagrams, acid mine drainage Topics in Pollution: chemical and biochemical oxygen demand. Toxic organic compounds including organochlorines, BCF and K_{ow}	Chapter 10
5	DDT, dioxins and PCBs, toxicology.	Chapters 13, 14 and 15
6	Toxic Heavy Metals General features of heavy metals and their toxicity, bioaccumulation of heavy metals. mercury, lead, cadmium, and arsenic. Radionuclides -radioactivity, decay kinetics.	Chapters 12 and 9
7	Reading week.	N/A
8	Soaps, Detergents and Detergent Builders -surfactants, amphiphilic substances. The Purification of Polluted Water Purification of drinking water, methods of disinfection. Treatment of wastewater and sewage. Modern wastewater purification techniques.	Chapter 11
9	Principles of Atmospheric Chemistry Composition of the atmosphere, variation of atmospheric pressure with altitude, electromagnetic spectrum, fate of solar radiation, principles of photochemistry, atmospheric concentration units, radicals, excited states, and ions. Principles of reactivity of important atmospheric species.	Chapters 1,2,3,4 and 5
10	Topics in Atmospheric Pollution Ozone layer depletion, stratospheric ozone, CFCs and others ODSs. Photochemical smog,	Chapters 1,2,3,4 and 5
11	Photochemical smog- detailed chemistry. Climate change, greenhouse effect, greenhouse gases	Chapters 1,2,3,4 and 5
12	Kinetics of atmospheric reactions. Particles in the Atmosphere , physical characteristics, basic chemical reactions in the atmosphere, physical behaviour, Stokes's law,	Chapter 4
13	Particles of special interest and their effects, Air Quality Index, PM index. Renewable Energy, Alternative Fuels, and the Hydrogen Economy Renewable forms of energy,	Chapters 4 and 8
14	Alternative fuels, hydrogen as a fuel.	Chapter 8

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

b) Laboratory: Thurs, 2.30 pm to 5.20 pm (F 356)

Chem 121-001 Winter 2023 Laboratory Schedule

Week # (Date)	Activity/Experiment	Lab Report Due Date (by 9.00 pm)
1. January 12 th	Laboratory Orientation/Lecture	
2. January 19 th	#1 Statistical Treatment of Data and the Measurement of Some Physical Properties of Natural Waters	January 26 th
3. January 26 th	#2 The Measurement of Dissolved Oxygen in Natural Waters	February 2 nd
4. February 2 nd	#3 The Determination of Orthophosphate in Water	February 9 th
5. February 9 th	#4 Alkalinity and the Carbonate System	February 19 th
6. February 16 th	Term Test 1	
7. February 23 rd	Reading Break	
8. March 2 nd	#5 The BOD/COD of Polluted Water	March 9 th
9. March 9 th	#6 Determination of Fluoride using an Ion-Selective Electrode	March 16 th
10. March 16 th	Group A: #7 The Conductivity of Natural Waters Group B: #8 Introduction to Gas Chromatography	March 23 rd
11. March 23 rd	Group B: #7 The Conductivity of Natural Waters Group A: #8 Introduction to Gas Chromatography	April 6 th
12. March 30 th	Term Test 2	
13. April 6 th	#9 Determination of Heavy Metals Using Atomic Absorption Spectrophotometry	April 13 th
14. April 13 th	Lecture/Review	

c) Prelab exercises are given for each experiment and must be completed and uploaded as a single PDF document on D2L by 2.30 pm on the day of the experiment.

d) A laboratory report must be submitted for each of the experiments performed. Each report must be done individually and uploaded as a **single PDF file** into the designated folder on D2L by the time indicated on the laboratory schedule.

e) Two term tests (each 2 hours).³

f) A three-hour written final examination at the end of the course on all the material in the course.⁴

Notes

1. Worksheets are handed out at regular intervals during the semester. Most are worked through in class but, in any case, solutions are posted on D2L.

2. Assignments are distributed at regular intervals during the semester. They typically have more challenging questions than on the worksheets. Again, they are not taken in for marking. Solutions are posted on D2L.

3. Tentatively scheduled for **weeks six and twelve** of the semester. These are written **during the lab period**.

4. The final will be set for the exam period following the end of classes. It will be a three hour written exam on all of the course material. The date and time will be posted on Camlink in February.

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 can 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
Term Test 1	17.5%
Term Test 2	17.5%
Final Examination	35%
Laboratory Work	30%
	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

Lecture Attendance To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, hand-outs, changed exam dates etc.

Laboratory Attendance and Requirements

- 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) Each experiment has a **Prelab Exercise** which must be completed and uploaded onto D2L as a **single PDF file** by 2.30 pm on the day of the experiment.
- d). 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.
- e). You **must pass both the lecture and laboratory** portions of the course separately in order to obtain a passing grade overall.
- f). All lab reports must be submitted by the time indicated on the laboratory schedule. Each report must be loaded as a single document in PDF form. Late lab reports may be graded but marks equivalent to 10% of the

total value of the assignment will be deducted for each day, inclusive of days on the weekend, past the deadline.

Exam Procedures All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student: a) notifies the instructor in advance of the exam (not after), and b) provides documented evidence of the circumstance (e.g. medical certificate). If an alternative test cannot be arranged the weighting from a missed test will be transferred to the final exam. 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 policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> CAMOSUN COLLEGE COURSE SYLLABUS If an exam is missed with an excused absence, it is up to the instructor's discretion as to how the mark will be made up. Be sure not to make travel plans for the end of semester until the final exam schedules are finalized and posted. Please ask any family members who might make travel plans on your behalf to consult you before booking tickets. Please note: the use of cell phones during a test or quiz is not allowed and may result in a zero for that assessment.

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 during the first week of classes.

Chemistry and Geoscience also has a study room (F 358) adjacent to the F 356 laboratory. The room is 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/>.

Support Service	Website
Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling

Support Service	Website
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 Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: <https://camosun.libguides.com/academicintegrity/welcome>

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

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 Progress

Please visit https://www.camosun.ca/sites/default/files/2021-05/e-1.1_0.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" (<https://camosun.ca/registration-records/policies-and-procedures-students/registration-policies-students>) 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://www.camosun.ca/sites/default/files/2021-05/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 250-370-3841

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.

Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

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.