CAMOSUN COLLEGE
School of Arts & Science
Department of Chemistry & Geoscience

CHEM-253-001
Environmental Chemistry
Winter 2018

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/chem.html

Ω *Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

1. Instructor Information

(a) Instructor	Neil Meanwell			
(b) Office hours	Mon, Tues: 12:30-1:30; Wed, Thurs: 11:30-1:30			
(c) Location	F348B			
(d) Phone	250-370-3448	**Alternative:**	250-729-	
(e) E-mail	meanwen@camosun.bc.ca or chemhelp@shaw.ca			
(f) Website				

2. Intended Learning Outcomes

Upon completion of this course the 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. Utilize 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.

3. Required Materials

(a) Texts: Environmental Chemistry, 5th Edition, Colin Baird and Michael Cann, Freeman

(b) Other: Chem 253 Lab Manual, In-house – available on D2l

(c) Safety glasses

4. Course Content and Schedule

(a) Scheduled lectures: Wed (P 109) and Thurs (WT 102) 9.30 am to 10.50 am.

(b) Scheduled labs: Mon (F 356), 9.30 am to 12.20 pm.

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

(d) Essay on a current environmental chemistry topic.

(e) 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.

(f) Midterm Exams: You will be required to take the following midterm exams:

Midterm Exam #1 Week 7 - 120 minutes duration. Written exam on the lecture material presented from Week 1 to Week 6 of the course. Scheduled for the lab period of Week 7.

Midterm Exam #2 Week 12 - 120 minutes duration. Written exam on the lecture material presented from Week 7 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.

Laboratory Schedule

Week Number/Date (Tuesday)	Experiment # and Title (Date Report is Due)
1. (8th January)	Safety Talk/Lecture
2. (15th January)	#1 Statistical Treatment of Data and the Measurement of Some Physical Properties of Natural Waters (22nd January)
3. (22nd January)	#2 Alkalinity and the Carbonate System (29th January)
4. (29th January)	#5 The Measurement of Dissolved Oxygen in Natural Waters (5th February)
5. (5th February)	#3 The Determination of Orthophosphate in Water (21st February – at lecture)
6. (12th February)	**No Lab – Family Day**
7. (19th February)	**MIDTERM #1**
8. (26th February)	#4 The BOD/COD of Polluted Water (5th March)
9. (5th March)	#6 Determination of Fluoride using an Ion-Selective Electrode (12th March)
10. **(**12th March)	#7 The Conductivity of Natural Waters/ #8 Introduction to Gas Chromatography (19th March)
11. (19th March)	#7 The Conductivity of Natural Waters/ #8 Introduction to Gas Chromatography (4th April – at lecture)
12. (26th March)	**MIDTERM #2**
13. (2nd April)	**No lab Easter Monday**
14. (11th April)	**No Lab – Lecture/Review**

Note: A late lab report will be penalised 4 marks immediately and 4 additional marks for each extra day it is late.

5. Basis of Student Assessment (Weighting)

(a) Review assignment: BONUS 5%

(b) Exams – 2 Midterms @ 17.5%; Final Exam 30%

(c) Laboratory work: 30%

(d) Essay : 5%

Notes: 1. You must pass **both** the lecture and lab portions of the course in order to pass the course

2. One midterm score can be replaced by an equal weighting from the final exam if the final exam percentage mark is better.

6. Grading System (tables at the end of this outline)

[X] Standard Grading System (GPA)

[ ] Competency Based Grading System

7. Recommended Materials to Assist Students to Succeed Throughout the Course

. Brief Summary of the Course Material

1. General Introduction (supplemented with handouts) 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) 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) 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) 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) Contamination of groundwater, purification of drinking water, methods of disinfection. Treatment of wastewater and sewage. Modern wastewater and air purification techniques.

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

8. Particles in the Atmosphere (Chapter 4) 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) (time permitting) 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) (time permitting) Renewable energy, alternative fuels, hydrogen as a fuel.

8. College Supports, Services and Policies

Immediate, Urgent, or Emergency Support
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

College Services
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

College Policies
Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS *http://camosun.ca/about/policies/index.html*

The following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at http://camosun.ca/about/policies/index.html for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	*Compulsory Withdrawal*: A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.