CAMOSUN COLLEGE	***School of Arts & Science*** ***CHEMISTRY AND GEOSCIENCE DEPARTMENT*** **CHEM 253-01** **Environmental Chemistry** **2013W**

COURSE OUTLINE

The Approved Course Description is available on the web @ _____

- *Please note: this outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*

1. Instructor Information

(a)	Instructor:	Neil Meanwell		
(b)	Office Hours:	Mon, Tues, Wed, Thurs: 11.30 am – 12.30 pm. Mon : 1.30 pm – 2.30 pm. Wed: 9.30 – 10.20 am		
(c)	Location:	F 348 B		
(d)	Phone:	370-3448	Alternative Phone:	(250)729-3838
(e)	Email:	meanwen@camosun.bc.ca or chemhelp@shaw.ca		
(f)	Website:	N/A		

Prerequisite: Chem 121 (C minimum)

Important Dates: Family Day: February 11th (Monday), Reading Break: February 21st – 22nd (Thursday and Friday), last day to withdraw without a failing grade: March 12th (Tuesday), Good Friday: March 29th, Easter Monday: April 1st.

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

(c) Safety glasses

4. Course Content and Schedule

(a) Scheduled lectures: Mon, 10.00 am to 11.20 am (F 214); Tues, 10.00 am to 11.20 am (P 107).

(b) Scheduled labs: Wed, 2.30 pm to 5.20 pm (F 356).

(c) Review assignment: The review assignment will be based on topics covered in Chem 120 and Chem 121 which are most relevant to environmental chemistry. It will be distributed early in the semester and taken in for marking at the beginning of week #5.

(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 e-mailed to you in PDF format.

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

Midterm Exam #1 Week 8 - 120 minutes duration. Written exam on the lecture material presented from Week 1 to Week 7 of the course. Scheduled for the lab period of Week 8.
Midterm Exam #2 Week 13 - 120 minutes duration. Written exam on the lecture material presented from Week 8 to Week 12 of the course. Scheduled for the lab period of Week 13.

(e) 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.

5. Basis of Student Assessment (Weighting)

(a) Exams – 2 Midterms @ 15%; Final Exam 35%

(b) Laboratory work: 30%

(c) Review assignment: 5%

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

6. Grading System. 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	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

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 E-1.5 at **camosun.ca** 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, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
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.

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

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

8. Brief Summary of the Course Material

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

ii. 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.

iii. 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.

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

v. 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.

vi. 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.

vii. 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.

viii. 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.

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

x. Renewable Energy, Alternative Fuels, and the Hydrogen Economy (Chapter 8) (time permitting) Renewable energy, alternative fuels, hydrogen as a fuel.

xi. Radiaoctivity and Nuclear Energy (Chapter 9) (time permitting) Radioactivity, radon, nuclear energy.

9. Laboratory Schedule

Week Number/Date	Experiment # and Title
1. (9th January)	Safety Talk/Lecture
2. (16th January)	#1 Statistical Treatment of Data and the Measurement of Some Physical Properties of Natural Waters
3. (23rd January)	#2 Alkalinity and the Carbonate System
4. (30th January)	**No Lab – Lecture**
5. (6th February)	#3 The Determination of Orthophosphate in Water/#4 The BOD/COD of Polluted Water
6. (13th February)	#3 The Determination of Orthophosphate in Water/#4 The BOD/COD of Polluted Water
7. (20th February)	**No Lab – Lecture**
8. (27th February)	**MIDTERM #1**
9. (6th March)	#5 The Measurement of Dissolved Oxygen in Natural Waters
10. (13th March)	#6 Determination of Fluoride using an Ion-Selective Electrode/ #7 The Conductivity of Natural Waters/ #8 Introduction to Chromatography
11. (20th March)	#6 Determination of Fluoride using an Ion-Selective Electrode/ #7 The Conductivity of Natural Waters/ #8 Introduction to Chromatography
12. (27th March)	#6 Determination of Fluoride using an Ion-Selective Electrode/ #7 The Conductivity of Natural Waters/ #8 Introduction to Chromatography
13. (3rd April)	**MIDTERM #2**
14. (10th April)	**No Lab – Lecture**

Notes: 1) Lab Reports are always due at the next laboratory session (when an actual experiment is being performed).

2) Late lab reports will be penalised 4 marks immediately and additional marks will be deducted from chronically late reports.