



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

CHEM-259-001
QA in Environmental Chemistry
Winter Term 2020

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	Blair Surridge
(b) Office hours	Thurs and Fri: 11:30-12:20pm
(c) Location	F348C
(d) Phone	250-370-3201 Alternative: _____
(e) E-mail	surridgeb@camosun.bc.ca
(f) Website	http://camosun.ca/learn/programs/chem/surridge.html

2. Intended Learning Outcomes

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

1. Overview of Environmental Monitoring

- Develop a program of quality assurance/quality control (QA/QC) protocols for a field and laboratory lake monitoring study.
- Identify and avoid potential sources of contamination of samples through the application of quality control and quality assurance methods.

2. Preparation for Field Monitoring [Two approximately half day field trips (on a Saturday or a Sunday) are required to collect water and sediment samples.]

- Prepare and calibrate water sampling instruments and equipment.
- Prepare sampling containers for the collection of water and sediment samples to be used for laboratory analysis.

3. Laboratory Techniques and Quality Control/Quality Assurance

The laboratory component will feature hands-on analysis of the samples collected during the field component. Students will work in groups of two. A list of equipment that will be used includes:

- Atomic Adsorption spectrophotometer (copper in sediments)
- UV/VIS spectrophotometer (phosphorus in water)
- Ion selection electrodes (calcium in water)
- Titration apparatus (dissolved oxygen in water)
- pH meters

At the end of this laboratory component students will be able to:

- Identify and use appropriate QA/QC procedures for tracking field and lab samples and the resultant data.
- Use laboratory equipment and procedures, including quality assurance monitoring of data.
- Develop and interpret standard curves and laboratory control charts.

- Interpret percent recovery data.
- 4. Data Analysis and Reporting for Chemistry**
- Use the spreadsheet Excel for organizing, copying and deleting data, and preparation of tables and graphs for report presentation.
 - Use graphical packages with Excel to produce linear regressions, vertical profile plots of field data and control charts of laboratory quality assurance data.
 - Perform basic statistical analysis on field and laboratory data including standard deviation, limit of quantification, limit of detection, mean, median and mode and comparison of two sets of data (students t-test).
 - Prepare a scientific data report of professional quality on the combined results of the field and lab data collected during the course.

3. Required Materials

- Course Lab Manual (Required for the first week on classes)
- Lab Coat and Safety Glasses
- Google account to be able to work with Google Docs (recommended)
- 2.0 USB Flash Drive (recommended)

4. Course Content and Schedule

CHEMISTRY LAB SCHEDULE

(1:30pm to 5:20pm every Friday in F354)

<u>WEEK</u>	<u>DATE</u>	<u>GROUP</u>	<u>ACTIVITY</u>
1	Jan. 10	ALL	- Introduction to course; selection of student groups. - Introduction to QA/QC. - Pipetting, cleaning, and calibrating - Monitoring strategies; field protocols; introduction to field equipment. - Field mobilization for Trip I: check lists; bottle preparation; instrument calibration.
2	Jan. 17 (Dry Run)	A B C	- Introduction to Methods: Copper in sediments (Atomic Adsorption). - Introduction to Methods: Phosphate (UV/VIS Spectrophotometer). - Introduction to Methods: Ca; Dissolved Oxygen.
3	Jan. 24 (Dry Run)	C A B ALL	- Introduction to Methods: Copper in sediments (Atomic Adsorption). - Introduction to Methods: Phosphate (UV/VIS Spectrophotometer). - Introduction to Methods: Ca; Dissolved Oxygen. - Prepare for Trip I.
4	Jan. 31 (Dry Run)	B C A	- Introduction to Methods: Copper in sediments (Atomic Adsorption). - Introduction to Methods: Phosphate (UV/VIS Spectrophotometer). - Introduction to Methods: Calcium; Dissolved Oxygen.

<u>Week</u>	<u>Date</u>	<u>Group</u>	<u>Activity</u>
4	Feb. 1		- Field Trip I (Saturday)

			- Group A to carry out wet weight measurements of sediments; dry sediments from Trip I
5	Feb. 7 (Trip I)	A B C	- Digestion of sediments for copper analysis and AA (Trip I) - Analysis of water samples for phosphates from Trip I; dry sediments (Trip I) - Analysis of water samples for dissolved oxygen, and calcium (Trip I) - Wet weight measurements of sediments; dry sediments from Trip I
6	Feb. 14 (Trip I)	C A B	- Digestion of sediments for copper analysis and AA (Trip I) - Analysis of water samples for phosphates; dry sediments (Trip I) - Analysis of water samples for dissolved oxygen, and calcium (Trip I) - Wet weight measurements of sediments; dry sediments from Trip I
7	Feb. 21	ALL	- Reading Break. No lab this week
8	Feb. 28 (Trip I)	B C A ALL	- Digestion of sediments for copper analysis and AA (Trip I) - Analysis of water samples for phosphates; dry sediments (Trip I) - Analysis of water samples for dissolved oxygen, and calcium (Trip I) - Prepare for Trip II.
8	Feb. 29		- Field Trip II (Saturday) - Wet weight measurements of sediments; dry sediments from Trip II
9	Mar. 6 (Trip II)	A B C	- Digestion of sediments for copper analysis and AA (Trip II) - Analysis of water samples for phosphates; dry sediments (Trip II) - Analysis of water samples for dissolved oxygen, and calcium (Trip II) - Wet weight measurements of sediments; dry sediments from Trip II
10	Mar 13 (Trip II)	C A B	- Digestion of sediments for copper analysis and AA (Trip II) - Analysis of water samples for phosphates; dry sediments (Trip II) - Analysis of water samples for dissolved oxygen, and calcium (Trip II) - Wet weight measurements of sediments; dry sediments from Trip II
11	Mar. 20 (Trip II)	B C A	- Digestion of sediments for copper analysis and AA (Trip II) - Analysis of water samples for phosphates (Trip II) - Analysis of water samples for dissolved oxygen, and calcium (Trip II) - Wet weight measurements of sediments; dry sediments from Trip II
12	Mar 27	ALL	-Trip to SGS Analytical Labs in Sidney
13	Apr. 3	ALL	- Glassware cleaning and group pictures!!

NOTES:

1. **Final Report.** Each student will prepare a separate report. An outline and all relevant data compiled in several spread sheet files will be provided. Relevant background papers and reports are available on a sign-out basis from the instructor. Sections of the report will be assigned as lab exercises to facilitate the preparation of the final version.

NOTE: The report is tentatively due on April 17, 2020. This will be confirmed in class. DO NOT BE LATE WITH THE REPORT. A grade based on course performance (without the report) will be submitted if a report is not handed in.

2. **Chemistry Lab Exercises.** Before each dry run lab, a pre-lab assignment must be handed in. At the end of each lab period, the data sheets are to be correctly filled out and placed in the data binder and the data entered into the database. No original data sheets are to leave the lab!! Marks will be deducted for incorrect or absent data sheets or data entry - these will be assigned to the group responsible.

COMPUTER LAB SCHEDULE

(1:30pm to 3:20pm every Monday in E100)

The computer lab component will include some lecture material on environmental chemistry and quality assurance. However, the main thrust will be a series of tasks which constitute the different data applications that are to be used in the preparation of the final report. In general, a different task will be covered during each week but time for data entry and report preparation will also be provided. You are upload a copy of each assignment to the d2l box. **NOTE: Make sure all material is backed up. Full names on all materials please.** Typically labs are due one week after it is assigned.

WEEK

OBJECTIVE AND ASSIGNMENT

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|---|--|
| 1 | Introduction to Excel. Data entry, copying and deleting formulas; simple math; use of Formula Wizard; confirmation of data entry.

Assignment 1. Preparation of Excel file; entry of lab data; use of formulas for calculations. |
| 2 | Introduction to Graphs. Organization of Data (x and y columns); introduction to Chart Wizard; graphing a linear regression (e.g., 00a standard curve).

Assignment 2. Preparation of a standard graph from a given set of standard. Use of the trend line formula to determine the concentration of several unknown solutions. |
| 3 | Preparation of Control Charts. Principles behind control charts; data entry; preparation of a control chart from a given set of data. |

- Assignment 3.** Preparation of a Control Chart from selected copper standards from 2001 data set
- 4 **Chem 259 Data Entry Protocols.** Data entry of examples of laboratory data following Chem 259 data protocols.
- Assignment 4.** Completion of data entry and formulas.
- 5 **Preparation of depth profile graphs.** Setting up the x and y data columns; plotting the down and up data (two profiles in single graph); plotting the mean values for each parameter against depth; plotting of several parameters on one graph.
- Assignment 5.** Preparation of a depth profiles.
6. Reading Break
7. **Control Chart** Based on present dry run data.
- Assignment 6.** Submit a full-sized control chart for calcium, total phosphorus, dissolved oxygen and total copper, based on the combined data of all groups from this year's Dry Run data.
- 8 **Basic Statistics.** Standard deviation, limit of quantification, limit of detection; calculation of mean, median and mode; calculation of standard deviation, LoQ and LoD from a data set; comparison of two sets of data (students t-test).
- Assignment 7.** Determine the LoQ and LoD from the copper standards data file provided. Compare different data sets to determine statistical differences.
- 9 **Analysis of Variance (Anova)** of simple data set.
- Assignment 8.** Determine whether there are differences between a number of water bodies for phosphorus and sediment copper.
10. **Data Entry and Report Preparation.** Draft report preparation.
- Assignment 9.** Preparation of the "Methods" sections of the report.
- 11 **Data Entry and Report Preparation.** Entry of 2012 results.
- Assignment 10** Preparation of the "Quality Assurance" Section of the report.

- 12 **Data Entry and Report Preparation.**
- Assignment 11.** Presentation of the Field Data from Trip I & II (data tables and graphs).
- 13 **Data Entry and Report Preparation.** Continued entry of 2012 results and draft report preparation.
- Assignment 12.** Data summary tables for calcium, dissolved oxygen, phosphate, percent moisture and copper results from Field Trip I
- 14 Complete Data Entry and Report Preparation.
- Assignment 13.** Presentation of Trip II results - data summary tables for calcium, dissolved oxygen, phosphate, percent moisture and copper results.

Computer Lab Assignments. A computer lab exercise will be assigned each week which are due the beginning of the chemistry lab on the Monday of the following week. Late assignments will be assigned a penalty of 20% of the lab mark. Labs will not be accepted after 5 weeks' time and a mark of "0" will be given.

5. Basis of Student Assessment (Weighting)

a)	Final Report:	35%
b)	Computer Lab Assignments:	35%
c)	Chemistry Lab Quality & Routine: (Includes: attendance, group work, datasheets, data entry, & technique)	20%
d)	Chemistry Lab Assignments: (Includes: prelabs & lab 1)	10%

6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

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

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://www.camosun.bc.ca/policies/policies.php>

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://www.camosun.bc.ca/policies/E-1.5.pdf> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> 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	<i>In progress:</i> 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	<i>Compulsory Withdrawal:</i> 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.