



School of Arts & Science
CHEMISTRY AND GEOSCIENCE DEPARTMENT
CHEM 224-01
Introduction to Analytical Chemistry
2012F

COURSE OUTLINE

This course provides an introduction to the theory and practice of chemical separation and identification. The major techniques are examined including chromatography, solvent extraction, spectroscopy and electrochemistry. The problems associated with data acquisition and the statistics of sampling are stressed throughout.

It is strongly recommended students keep this outline for your records.

Prerequisite: Chem 121 (C grade minimum)

1. Instructor Information

(a)	Instructor:	Blair Surridge (http://camosun.ca/learn/programs/chem/surridge.html)		
(b)	Office Hours:	Thurs: 10:30 – 12:20 Mon, Wed, & Fri: 11:30-12:20		
(c)	Location:	F350A		
(d)	Phone:	370-3438	Alternative Phone:	
(e)	Email:	SurridgeB@camosun.bc.ca bsurridge@shaw.ca (home)		

2. Intended Learning Outcomes

At the end of this course, the student will possess an enhanced ability to:

1. Define and calculate the mean, median, mode, variance and standard deviation for a series of replicate analyses. Estimate the population mean from analysis of a small number of trials. Test for the rejection or retention of suspect data. Explain and use the least squares procedure to graph experimental data.
2. Describe and explain the procedures for gravimetric and titrimetric analyses: obtain data that falls within the established margins of error for the methods.
3. Derive and apply the Beer-Lambert law and use internal and external standards to ensure the validity of the analysis. Distinguish between absorption, emission, fluorescence and phosphorescence. Obtain absorption and emission spectra from various sources and perform a complete quantitative analysis on the samples provided. Explain and use light scattering techniques to estimate the turbidity of solutions.
4. Distinguish between the major modes of radioactive decay and between the activity of the sample and the dose received by the absorber. Estimate the

age of fossils and artifacts via carbon and argon dating techniques and the concentrations of trace materials using neutron activation and isotope dilution techniques.

5. Identify and describe the mode of operation for the four major types of electrode. Distinguish between constant current and constant potential coulometry and use them to estimate the concentrations of particular ions in solution. Distinguish between normal and pulsed polarography and analyze polarograms obtained from mixtures of metal ions.
6. Describe, explain and apply the techniques of solvent extraction, distillation, sublimation, and the major forms of chromatography to the separation of a mixture.
7. Discuss the basis for improvements in the signal to noise ratio of a measurement. Distinguish between the Fourier transform and continuous wave methods of recording data. Explain the process of analogue to digital conversion.
8. Construct a null point hypothesis; use one or two tailed significance tests to reject or retain the hypothesis. Use a paired t test to compare two different methods of analysis for the same sample

3. Required Materials

Text	◆ "Quantitative Chemical Analysis" 8th Edition, by Daniel C. Harris (Freeman and Company)
Other	◆ Chem 224 Lab Manual (Safety glasses mandatory & lab coat recommended) ◆ A Small hard backed laboratory notebook (from bookstore)
In Library On Reserve	◆ "Fundamentals of Analytical Chemistry" 8 th addition, by Skoog, West, Holler, and Crouch

4. Course Content and Schedules (news items, laboratory information, and supplemental learning material can be found on D2L)

Lectures:

Monday	10:30 to 11:20 am in Young Building, Y325
Wednesday & Friday	10:30 to 11:20 am in Wilna Thomas Building, WT202

Unit	Topic	Textbook Reference* (Select topics only)
1	Analytical process, measurement, experimental error, and statistics	Ch. 0, 1, 3, and 4
2	Classical methods (Gravimetric and Titration)	Ch. 26
3	Methods of Calibration and Quality Assurance	Ch.4 and 5

4	Spectrochemical Methods	Ch. 17, 18, 19, and 20
5	Methods of Separation	Ch. 21, 22, 23, and 24
6	Electrochemical Methods	Ch. 13 and 14

- note we will not be covering the sections given in the text in complete detail. Specifics are given in the class lecture notes

Chem. 224 Lab Schedule Monday 2:30-5:20pm in F356

(note: ideally your lab group will consist of no more than 2 students to maximize time on lab instrumentation)

Week	Lab Date	Experiment No.
I	Sept 3 th	Labour Day, No meeting
II	Sept 10 th	Lab # 1, Introduction & skills assessment
III	Sept 17 th	Lab # 2, Analysis of halide ions using silver nitrate
IV	Sept 24 th	Lab # 3, Calibration of Instruments
V	Oct 1 st	Lab # 11, Isotopic dilution and separation of mixtures
VI	Oct 8 th	College Closed - Thanksgiving Day!!
VII	Oct 15 th	Lab # 4, UV/Vis Spectroscopy
VIII	Oct 22 nd	Midterm (2 hrs)
IX	Oct 29 th	Lab # 5, Atomic Absorption Spectroscopy
X	Nov 5 th	Lab # 9, Chromatography Part 1 (GC Analysis of Hydrocarbon Mixture)
XI	Nov 12 th	College Closed – Remembrance Day Observed!!
XII	Nov 19 th	Lab #9 Chromatography Part 2 (GC/MS Analysis of BPA in Water)
XIII	Nov 26 th	Lab # 7, Ion selective electrodes
XIV	Dec 3 rd	Tour of Federal Lab: Institute of Ocean Sciences or Provincial Forestry Lab OR Lecture Wrap-up and Final Exam Review

5. Basis of Student Assessment (Weighting)

Labs	25%
Quizzes	20% (in class best 5 of 6)*
Midterm (Units I, 2, 3, & 4**)	20% (Week VIII Lab Period, 2-hour)
Final Exam (comprehensive)	35% (TBA ~Week XV, 3 hours in Dec)

*Tentatively 6 quizzes scheduled. You will receive at least 3 days of notice before a quiz and details will be posted on D2L!! Only the top 5 quizzes will be counted.

**Expected to cover only part of unit 4 material – an outline will be provided ahead of time for the midterm and the final exam.

Notes:

- (1) Student must pass the lab and lecture component of the course to obtain credit for Chem 224. All labs are to be attended and individual lab reports completed following the format provided in the lab manual.

- (2) Immediate contact must be made with instructor for missed labs due to illness or family emergencies for arrangements to be made. This should be done by email. For more information see lab manual.
- (3) A test score that is not as high as that of the December final exam will be dropped automatically and its weight redistributed to the final exam. For example, if a low score is obtained on your midterm then your final exam will then be 55% of the course grade!
- (4) No one is allowed to write exams late and there will be no exceptions. Early exam is a privilege and not a right; thus, at full discretion of the instructor. In the event that the midterm is missed the marks will be weighted to the final exam as per point 3) above.

Important:

Students may not use recording devices in the classroom without the prior permission of the instructor. However, the instructor's permission is not required when the use of a recording device is sanctioned by the College's Resource Centre for Students with Disabilities in order to accommodate a student's disability and when the instructor has been provided with an instructor notification letter which specifies the use of a recording device. Recordings made in the classroom are for the student's personal use only, and distribution of recorded material is prohibited. Cell phones should be turned off will in class.

6. Grading System

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

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	<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, 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. <i>(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)</i>
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.

7. Important Dates

Week

III Sept. 20: Fee deadline

VI Oct.8: Thanksgiving Monday-College Closed

XI Nov 12: Remembrance Day Observed – College Closed

XV Start of Exam Period for Winter 2012

Use this link to check out scholarships and bursaries

<http://camosun.ca/learn/calendar/current/pdf/financial-assistance.pdf>

8. 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.