DALHOUSIE UNIVERSITY

Faculty of Graduate Studies Course Syllabus
Department of Chemistry
Chemistry 6262
Bioanalytical Separations
Winter, 2022
Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

Lecturer: Dr. Alan Doucette Chemistry, Room 509 e-mail: alan.doucette@dal.ca

Lectures: Tuesdays 9:35-11:55, Chemistry Room 509.

Laboratories: 2 x 3-hr labs, to be scheduled, Chemistry 501/503.

Course Delivery: In-person lecture & labs. The course will incorporate weekly guided self-study, with lectures primarily intended as open discussions between the instructor and the student to probe their understanding of the weekly topics.

Course Description (from calendar)
An overview of analytical technologies for separation of biological mixtures, with emphasis on protein fractionation. Both the fundamental theory as well as practical application of techniques will be covered. Specific techniques include reversed phase, ion exchange and affinity chromatography, gel and capillary electrophoresis.

Course Prerequisites
No formal prerequisites. However, students should have a basic understanding of analytical chemistry, as presented in Chem 2201.

Learning Objectives

- To acquire an understanding of the scope and practice of analytical chemistry.
- To appreciate the variables influencing the quality of chromatographic and electrophoretic separations.
- To become proficient in operational skills for a laboratory-based method of separation.
- To plan and conduct a separation-based experiment, based on prior published work.
- To appreciate safe working practices within a chemistry laboratory.
- To organize and summarize information on a topic and teach said topic to others.
- To develop written science communication skills, including basic formatting and organization.

Course Materials

Weekly self-study topics will be provided, for which the student is welcome to use any suitable resource to learn the material. Textbooks, videos, peer-reviewed manuscripts, and first-hand discussions with others are all welcome.

PPE: Approved safety glasses and lab coat are required to work in the lab.

Office Hours
Please reach out at any time or schedule an appointment.

Course Assessment [A]

Component	Weight[A]	Date(s)
Assignments	30%[B]	Weekly, based on reading assignments
Formal Presentation	25%[C]	Towards end of term
Essay	25%[D]	Last day of term
Lab Presentation	20%[E]	Towards end of term.

Notes and Policies on Course Assessments:

(A) ***Assessment components*** (dates, weight, and delivery) are subject to change should the course be affected by partial or temporary school closures or cancellations, including a prolonged employee strike. Short term closures (eg a storm) can be solved by rescheduling the weekly lecture or lab to a mutually agreeable time. However, as this course is only 6 weeks in duration, the impact of a potential faculty strike may be severe. Cancellations extending beyond 1/3 the duration of this class suggests that the learning outcomes of the course cannot be met and will therefore jeopardize receiving credit for completion of this course.

(B) Weekly assignments are based on the guided self study topics and will be assessed in two ways (1) Classroom participation, 50% (2) Your digital compilation of course materials, including reading or video resources, and written answers to questions (50%). Details on methods of evaluation will follow in class.

(C) The formal presentation constitutes a ~45 min lecture on a separations-based topic chosen by the student. The topic should be presented as a 'teaching' style lecture, appropriate to graduate chemistry students. The topic can be related to the student's own research. The specific presentation date can be chosen by the student. Other students in the class (or beyond this class) may attend. Students (and the instructor) will ask questions during and following this lecture.

(D) The written essay will be based on the same general topic as delivered through the formal presentation. The essay will take the style of a formal review manuscript. The due date for this essay can extend beyond the final lecture date, with the only limitation being that your final grade cannot be determined until after this essay is submitted and evaluated.

(E) The lab is intended to give the student hands-on experience in a topic of separation of their choosing. The lab will be evaluated through a presentation given by the student, summarizing the goals of the experiment, how it was accomplished, what they have learned, and what they would do differently if repeated.

Grade Scale

Conversion of numerical grades to final letter grades follows the Dalhousie Common Grade Scale.

A+	A	A-	B+	B	B-	F
90+	85+	80+	77+	73+	70+	<70

A+, A, A- Considerable evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of subject matter; evidence of extensive knowledge base.

B+, B, B- Evidence of grasp of subject matter, some evidence of critical capacity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.

Lecture Format

This class will be taught in a discussion format, meaning that the student will be an active participant in determining the depth of content they learn. Weekly assignments guide the reading topics for the students, and as we meet we will discuss the assigned topics/ questions. The student presentation also allows the individual to spend more time learning a favored topic, and the rest of the class will benefit from their efforts. The written report concerns a review of the scientific literature, and should benefit the student with their own research. Class discussion/ participation is essential as the lecture format dictates a shared participation in teaching the class.

Course Policies

Absences. If students are unable to attend a weekly lecture or lab, they are responsible for notifying the instructor ***as soon as possible*** (phone, e-mail or in person). Since the lecture is primarily a classroom discussion, any missed lecture will be rescheduled to the soonest possible date. The deadlines for presentations, written reports, and labs, are not rigid. However, the student cannot be credited for completion of this course until all assessment components are completed.

E-mail. Use e-mail for issues related to administrative matters or short queries related to content. If the student has more probing questions related to course content, an in person (or Teams) meeting is seen as a better format to discuss these matters.

Academic Integrity. Students are encouraged to work with others on the weekly self-study topics, as well as the lab. Students can receive feedback from others on their presentations and written reports. However, the bulk of the work is assumed to be based on individual work by the student.

Topic Breakdown (subject to change, as dependent on the students taking this class)

1) Chromatography Theory

Equilibrium/ Absorption/ Partitioning
Plate Theory
Rate Theory
Modes of Chromatography (Gas vs Liquid)
Gradient separation (temperature/ solvent)
Reversed Phase
Ion Exchange
Size Exclusion

2) Chromatography Practical Application

Instrumentation
Flow rate/ pressure
Band broadening – extra column
Sample compatibility

3) Specialized Topics in Chromatography

Miniaturization and chip separation
Packing size & composition
Multidimensional separations
ESI / coupling to mass spectrometry

4) Electrophoresis Theory

Voltage/ Current - basics
Capillary zone electrophoresis
Electropherogram
Broadening

5) Electrophoresis Practical Application

Detectors
Sample injection
DNA sequencing
Capillary conditioning/ protein adsorption

6) Specialized Topics***

Coupling to mass spectrometry
Isotachophoresis
Isoelectric focusing
Precipitation / solvent extraction

***** More or less time can be devoted to any of these topics.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. **Information**: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).
Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.
Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness **Statement**: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca). **Information**: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://www.dal.ca/academics/important_dates.html

University Grading Practices
https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/servicessupport/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-toget-help/ombudsperson.html

Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Dalhousie COVID-19 information and updates: https://www.dal.ca/covid-19-information-and-updates.html