

Chem 3201: Analytical Spectroscopy and Separations
Winter, 2020

- Instructors:** Dr. Rory Chisholm roderick.chisholm@dal.ca *Live Help Session: TBA*
Clay Sinclair clay.sinclair@dal.ca *Live Help Session: TBA*
- Lectures:** (Monday 13:30-14:30) 1 hr weekly meetup via Microsoft Teams (recorded)
- Laboratory:** 1 × 1-hour Remote Lab Assignment Meeting per week (M pm; T am; T pm).
1 × 1-hour Case Study Meeting per week (Wpm; TR am; TR pm).
First lab = Jan 08 or 09 Meeting time as scheduled
- Office Hours:** By appointment. To schedule a one-on-one meeting please email your instructor and book an appointment. Meetings will occur via Microsoft Teams
- Website:** Brightspace includes a complete class schedule, electronic copy of textbook readings, videos, supplementary notes and readings, practice problems, and grades.
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Course Description:

An introduction to the fundamentals of instrumental chemical analysis is presented in a laboratory environment, with emphasis on selection of appropriate analytical techniques, sample treatment, data handling, and communication of experimental results. Instrumental techniques include chromatography, spectrophotometry, mass spectrometry, and electrochemistry, with applications in biological, environmental, forensic and health-related areas.

Course Prerequisites:

Chem 2201 or equivalent. Grade of C- or better.
Exclusion: Chem 3201

Objectives/ Learning Outcomes:

The learning outcomes associated with each experiment are described in your lab manual. There are several overarching themes:

- Time management, including proper planning and scheduling of preparing presentations and assignments
- Team work, organizing and working closely with your Remote Lab Group. You will be scheduled for a weekly mandatory 1 hr Remote Lab Meeting (with a TA), however you will have to meet and work with your group outside this scheduled time.
- Communication (written, presentation and oral), Group case studies will be evaluated by the submission of a powerpoint presentation (including recorded and imbedded audio within the powerpoint file). You will also be evaluated via individual assignments. This will include data analysis, presentation and interpretation of results.
- Effective reporting of data in graphical and tabulated formats.
- Calculation of concentrations, and unit conversion, statistical analysis
- Problem solving, which first relates to recognizing that you are facing a problem, diagnosing the problem and researching solutions.
- Effective use of literature (literature searching and interpretation of literature related to theories described within the class).
- Critical assessment of the quality of your work as well as others (class members and literature)
- Creativity and independence
- Experimental design, through the use of literature and understanding of key concepts you will design experiments to test a hypothesis. (via a case study later in the term)
- Become familiar with the fundamental theory and practical application of the following analytical techniques: molecular absorbance and emission; Raman spectroscopy/ Surface enhanced Raman; Fluorescence theory/instrumentation and advanced applications; gas and liquid chromatography; mass spectrometry, tandem MS and different modes of ionization; electrophoresis; as well as analytical sample preparation, buffer preparation, analyte extraction, derivatization, purification and recovery, methods of calibration including direct standardization, internal standards and standard addition.

Course Format:

This course will be taught in two-week module sets. At the end of the module your Group case study presentation (Fridays) and individual assignment (Sundays) will be due. See the course calendar for due dates and content schedule. Assigned readings will be available via brightspace (no required textbook to purchase) and accompanying content videos will be available within each module. Weekly meetups will occur 1:30 – 2:30 pm Mondays for 1 hour live via microsoft teams. These weekly meetups are not intended to substitute the readings and content videos, but rather provide an overview of the content, discussion of key or difficult concepts and provide the opportunity for student questions.

Remote Case Study meetings (mandatory) will occur on a weekly basis for 1 hour. At these meetings your TA will introduce the group case study, discuss via content and/or exercises related to the case study and provide feedback into your group case study presentation. It is expected that a draft of the group's presentation will be discussed at the second week's remote lab meeting. This is your opportunity to receive feedback, ask questions and make improvements on your presentations. Failure to do so will result in unfortunate reduction in grades as concepts may be missing or not discussed adequately.

Remote Lab Assignment Meetings (semi-weekly 1 hour) will include realistic data analysis and interpretation related to the various modules. See the course calendar for the various due dates. Lab Assignments are designed using individual data sets and are to be submitted individually. Students are encouraged to work and collaborate together however each individual is expected to complete and understand their own material. Remote Lab Assignment meetings will occur within your groups (as scheduled; see course calendar for various dates). At these meetings a Teaching Assistant will introduce the assignment and key concepts for success. It is advised that you attempt the assignment before the meeting to ensure maximum understanding of the discussion. These meetings are not to be used for the Teaching Assistant to walk you through each question, but rather they will aid in the understanding of the concepts. As each assignment is individual, the TA's will discuss the methods and interpretation of the data and cannot review everyone's individual numbers.

Midterms and final exam evaluation will include a combination of questions related to the theory discussed within the readings, content videos and case studies as well as data analysis and interpretation as conducted within the assignments.

Course Assessment:

Assessment	Weight	Date
Group Case Study Presentations	25%	As scheduled ¹
Assignments	25%	As scheduled ²
Midterm 1	12.5%	Feb 25 (6pm-7:30pm)
Midterm 2	12.5%	April 2 (6pm-7:30pm)
Final Exam*	25%	(Schedule by registrar)

¹See 'Group Case Study Presentations' for information

²See 'Assignments' for information

*Final exam is a cumulative written test covering all aspects of the course

Conversion to Final Letter Grades as per Dalhousie Common Grade Scale:

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

School Cancellations:

Weather-related closure of the University or power/internet outage may impact submission of your Group Case Study Presentations or Assignments, in which case the due date will be moved to the next day that the University is open. Email your instructor as soon as possible if power or internet outage is impacting your submission.

Group Case Study Presentations:

Group case studies involve understanding the module content and expanding this theory to think outside the box in approaching the case study situation. Each case study directly related to the module content, however these require you to work as a group to communicate your ideas via a short (no more than 8 min) powerpoint presentation pre-recorded. The case study will be introduced by your TA in the first week of the module. There the TA will discuss key concepts and related activities for your group to thoroughly understand the task. Your group will have to self organize, direct tasks, and prepare the presentation, outside regular class time. The second week of the module you will share your presentation, and receive feedback from your TA. Additionally, this is an opportunity for you as a group to ask for clarification and ask questions related to the case study. One powerpoint file per group (with embedded audio) is to be submitted Friday by 11:59pm via brightspace. It is expected that all students will participate equally within the organization and preparation of the case study. In addition to the presentation submission, the group will submit a list of duties indicating everyone's involvement.

The first week of class, you will meet your group and TA at your scheduled time and discuss the organization of the remote lab meetings and the case studies. At this initial meeting, you as a group will detail a group contract (signed by all group members) outlining procedures for the group to follow. This

will include, when to meet outside regular class times, how/when to organize individual tasks, and importantly detail processes to follow should issues arise within the group. Should a group member not fully participate or neglect their duties, the group is to consult their group contact (written during week 1) and follow the guidelines and procedures they detailed. The case study presentation is to be evaluated as a group and all group members will receive the same grade. Refer to the course calendar for case study submission dates.

Lab Assignments (individual):

Assignments are intended to provide the student with the opportunity to process and interpret real data related to the course module. Assignments are individualized and therefore are to be submitted individually. Despite the individual aspects of the assignments, we realize the benefits of working together and therefore we encourage students to work together and collaborate in the understanding of the data analysis and interpretation. But you cannot just copy from each other as understanding these methods will be key to succeed on the midterms and final exam. Your methods and numeric values for your individual assignment will be evaluated. Assignments are to be submitted via brightspace the end of second week of the module by Sunday 11:59pm (see calendar for details). Refer to the course calendar for assignment submission dates.

Feedback:

Written reports/assignments can only be returned to the student once the entire class has completed and submitted the report for that particular experiment. Feedback will occur by Remote Lab Meetings with your TA, posted through the course website, and/or discussed during the course tutorials. Students are also encouraged to meet with the instructor to discuss their presentations/assignments.

Late submission policy:

Late submissions (anywhere from 5 minutes overdue to 1 week late) will receive a grade of zero. Email your instructor as soon as possible if power or internet outage is impacting your submission.

Missed Remote Lab Meeting /Illness:

All remote lab meetings are required and considered mandatory. Groups are expected to detail a process in which to follow should a group member miss a remote lab meeting. Missing a remote lab meeting does not excuse that member from participating within the case study.

Midterms and final exam:

Midterms and final exams will include a combination of questions related to the module theory as well as the data analysis/interpretation skills from the assignments. Both midterms and final exam are to occur individually. These evaluations will be timed (midterms 1.5 hours, final 3 hours) with an additional 30 minutes uploaded time and answers are to be submitted as a single pdf file presenting all of your hand written work as clear images within the testing document. As these evaluations are conducted online this is no way to enforce open or closed book policies, so feel free to consider these evaluation processes as open book, however I would not recommend relying on this open book policy during the tests. It may not even help and only hinder your progress and time.

We are aware and actively monitor cheating websites. Should we observe any similarities between your test and other members of the class we will treat this as a suspect academic offense. If

anyone contacts you during the test you are expected to report this contact immediately. You will more than likely run out of time attempting to help anyone or ask anyone questions. Additionally, this is an academic offense.

Students are expected to have Microsoft teams open at all times during the tests for instructions as well as opportunity to ask questions. To ask a question, type "I have a question" in the text feed and an instructor will direct you to a breakout room to meet privately. Be sure to have your mic off but audio on to listen for instructions. Feel free to have your video off

Accommodation Policy For Students:

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. **Student Accommodation Policy:** http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the **Advising and Access Services Centre (AASC)** prior to or at the outset of the regular academic year. More information and the **Request for Accommodation** form are available at www.dal.ca/access.

Academic Integrity:

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

Policy on Intellectual Honesty and Faculty Discipline Process:

https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Student Code of Conduct:

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Copyright:

All members of the Dalhousie community are expected to comply with their obligations under Canadian copyright law. Dalhousie copyright policies and guidelines, including our Fair Dealing Guidelines, are available at <http://www.dal.ca/dept/copyrightoffice.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

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Services Available to Students:

The following campus services are available to all Dalhousie students. Unless noted otherwise, the services are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with <ul style="list-style-type: none"> - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties 	Killam Library Ground floor Rm G28 Bissett Centre for Academic Success	In person: Killam Library Rm G28 By appointment: <ul style="list-style-type: none"> - e-mail: advising@dal.ca - Phone: (902) 494-3077 - Book online through MyDal
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	Killam Library Ground floor Librarian offices	In person: Service Point (Ground floor) By appointment: Identify your subject librarian (URL below) and contact by email or phone to arrange a time: http://dal.beta.libguides.com/sb.php?subject_id=34328
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	Killam Library 3rd floor Coordinator Rm 3104 Study Coaches Rm 3103	To make an appointment: <ul style="list-style-type: none"> - Visit main office (Killam Library main floor, Rm G28) - Call (902) 494-3077 - e-mail Coordinator at: sfs@dal.ca or - Drop in to see us during posted office hours All information can be found on our website: www.dal.ca/sfs
Writing Centre	Meet with a tutor to discuss writing assignments (lab report, research paper, thesis, poster) <ul style="list-style-type: none"> - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field 	Killam Library Ground floor Learning Commons & Rm G25	To make an appointment: <ul style="list-style-type: none"> - Visit the Writing Centre in the Killam Learning Commons (Rm G40) and book an appointment - Call (902) 494-1963 - e-mail writingcentre@dal.ca - Book online through MyDal We are open six days a week See our website: writingcentre.dal.ca