



Chemistry

UNIVERSITY OF TORONTO

CHM 317H: Introduction to Instrumental Methods of Analysis

Winter Semester Course Syllabus

I TEACHING TEAM

LECTURE INSTRUCTOR



Name: Prof. Rebecca Jockusch

Email: Rebecca.jockusch@utoronto.ca

Office: Lash Miller 253 (but not used in pandemic times)

Student hours (provisional – see course website for links and any updates): Monday and Wednesday directly after class until 3:30 pm, Thursdays 12:10-1:00 PM or by appointment.

LABORATORY INSTRUCTOR



Name: Prof. David Stone

Email: david.stone@utoronto.ca

Office: LM218 (but not used in pandemic times)

Student hours: During labs MTW 10-noon or on-line by appointment

II COURSE OVERVIEW

COURSE DESCRIPTION:

CHM317 is designed to familiarize upper-level undergraduate students with important aspects of instrumental analysis. It is the second in a series of courses covering the science of chemical detection, identification, and measurement. It builds on principles and practices discussed in CHM217. Course topics include optical spectroscopies (absorbance, scattering, emission), mass spectrometry and chemical separations.

STUDENT LEARNING OUTCOMES:

By the end of CHM317, students will be able to

- understand the fundamental chemical and physical properties that are put to use in the instrumental techniques discussed in the course (several optical spectroscopies, mass spectrometry and separations).
- understand, describe and apply the operating principals of the instruments discussed in this course (instruments for measuring UV/visible absorption, IR absorption, fluorescence, tandem mass spectra and separations based on liquid- and gas-chromatography).
- evaluate and use data obtained using the instrumental methods and techniques discussed.

- account for sources of error and noise in instrumental analyses.
- understand the advantages and limitations of the various instrumental techniques discussed, and through this knowledge be able to choose appropriate analytical method(s) to answer analytical challenges.

PREREQUISITE COURSES:

This course builds on principles and practices discussed in CHM217(Introduction to Analytical Chemistry), which is a prerequisite for this course. Calculus I and II (e.g., MAT 135 & MAT 136) or equivalent are also prerequisites.

TEXT:

Required: "Principles of Instrumental Analysis," Skoog, Holler and Crouch, 6th Edition (Thomson & Brooks/Cole) or 7th Edition (CENGAGE Learning).

III COURSE ORGANIZATION

CHM317 is comprised of both "lecture" and "laboratory" components. This year, both lectures and labs will both be on-line until at least the end of January. After that, depending on University policy, we may switch back to in-person sessions. Please check the course website for any updates.

Each week you are expected to participate in two, 50-minute "lecture" classes and a laboratory session. Final course marks depend on your performance on three tests (totaling 60% of the course mark) and the laboratory mark (40%). The laboratory mark includes marks for lab performance, writing exercises, and four written lab reports (see below).

"Lecture" classes are held Mondays and Wednesdays 2:10-3:00 pm (Toronto time). These start on Monday, January 10. Synchronous on-line sessions will be held over Zoom during the month of January. Updated information about how to join into the synchronous sessions is posted on our Quercus course website. While we strongly encourage you to participate in class synchronously, the class sessions also will be recorded and made available through our Quercus website. **Notes for lecture** will be posted to the course website before class. In past years, many students have found that they learn best by taking their own notes, and only using the posted notes as "backups." Other students prefer to annotate the pre-posted notes.

A tentative schedule of lecture topics with reading assignments will be posted on the course website accessible through Quercus. Several optical spectroscopies will be the focus of the first half of the semester. We will then move on to discuss mass spectrometry and end the semester by focusing on separations. We strongly recommend "pre-reading" the text before the associated synchronous session. This will enable deeper discussion of topics.

Problem Sets will be posted on the Quercus website as the course progresses. The problem sets will not be collected or graded; however, completing the problem sets is *the single best method to prepare* for the two midterms and the final assessment. Answers will also be posted, but the instructors urge you not to look at the answer

keys until you are certain that you have the correct answers. If you are uncertain how to solve a problem, it is much better to discuss the problem with you peers, TAs or course instructors before turning to the posted answers.

Practicals (labs) will be held on-line for January 2022 but will revert to in-person effective Jan 31st circumstances permitting. Pre-lab orientations will be held on-line the week of January 10, with virtual laboratories beginning the week of January 17. Full details and all lab materials will be available through Quercus. The virtual labs will be live-streamed events scheduled from 11-1; in-person labs will be the full timetabled session. Evaluation will be based on laboratory performance, a writing development exercise, and four formal reports.

LABORATORY OBJECTIVES:

The overall goal of the laboratory component is to provide students with practical experience in using significant instrumental methods for chemical analysis. Students will, in addition, have opportunities for developing and demonstrating key transferrable skills such as: collaboration, communication (primarily written), data analysis and interpretation, and safe working practices. Students will gain experience with: reflectance FTIR, fluorescence, and atomic spectroscopy; and both gas and liquid chromatography.

IMPORTANT COURSE AND SESSIONAL DATES:

January 10: first day of CHM317 synchronous "lecture" class
January 10,11 or 12: virtual lab orientation session 11 (sharp)-1
January 17, 18 or 19: first day of regular CHM317 on-line lab
January 31 onwards: provisional date for resumption of in-person labs
February 16, no lecture, term test 1, 6:30-8:00 pm
February 21-25: family day and reading week (no classes)
March 21: no lecture, term test 2, 6:00-8:00 pm
April 6: last day of CHM317 lecture
Final assessment: provisionally scheduled for April 19, date and time to be confirmed.

IV EVALUATION/GRADING SCHEME

Term Test 1: (February 16, 6:30-8:00 pm Toronto time)	12%
Term Test 2: (March 21, 6:10-8:00 pm Toronto time)	23%
Final Assessment (Test 3) (Tentative date: April 19, to be confirmed)	25%
Laboratory Mark	40%
<hr/> Total	<hr/> 100%

Please inform Prof. Jockusch as early as possible if you are unavailable during a scheduled assessment time. Alternate sittings of either an on-line written or oral test may be arranged.

IMPORTANT: if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affects availability or functionality, it may be necessary to revise the timing or weighting of the labs and assessments.

V COURSE POLICIES

- Communication with instructors
 - We note that if you have a science question, please consider asking your question “live” during class or lab sessions, during on-line student hours, or posting on the course discussion board where your classmates can benefit from the question and answer(s).
 - Students may contact the lecture instructor via email (rebecca.jockusch@utoronto.ca) and may address her as “Rebecca,” or as Prof./Dr. Jockusch if you feel more comfortable with that. Please include your full information, including student number, on any emails. Rebecca does not read email on the weekends, but otherwise she will try to respond within 24-hours.
 - Students may contact the lab coordinator via email (david.stone@utoronto.ca). Please include your full information, including student number and laboratory section on any emails.

- Each member of this course is expected to maintain a:
 - (i) professional and respectful attitude during all course activities, including classes, laboratories, tutorials and online activity.
 - (ii) personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
 - (iii) collection of notes recorded independently based on concepts covered in course activities (students registered with Accessibility Services requiring a class note-taker will have access to this accommodation)
 - (iv) familiarity with the university policy on Academic Integrity (overleaf)

Course Environment:

- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another’s differences. As a Course Instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.

Privacy and Appropriate Use of Course Materials:

- This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.
- Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor.
- For questions about recording and use of videos in which you appear please contact your instructor.

Penalties for Lateness:

- If you know ahead of time that a lab assignment will be late, please discuss this with the appropriate instructor. The standard penalty is 5% per day.

Missing Tests:

- Please inform Prof. Jockusch as early as possible if you are unavailable during a scheduled assessment time. Alternate sitting of the test may be arranged. Students who are unable to take a test due to illness or other personal circumstances should contact the lecture instructor as soon as possible. Oral assessments with the instructor may be used to replace missed tests.

VI TECHNOLOGY REQUIREMENTS

- Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here:
<https://www.vicprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/>
- Advice for students more broadly regarding online learning is available here:
<https://onlinelearning.utoronto.ca/getting-ready-for-online/>
- This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.

VII INSTITUTIONAL POLICIES & SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters

(governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In virtual laboratory reports:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any report. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post virtual laboratory report material/questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.**

On quizzes and term tests:

1. Using or possessing unauthorized aids. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.**
2. Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
3. Misrepresenting your identity.

In general academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.academicintegrity.utoronto.ca/).

PLAGIARISM DETECTION

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>).

COPYRIGHT

If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here: <https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/>

ACCESSIBILITY NEEDS

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact [Accessibility Services](#) as soon as possible.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES

Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

ADDITIONAL SERVICES & SUPPORT

The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at [Student Life](#)
- Full library service through [University of Toronto Libraries](#)
- Resources on conducting online research through [University Libraries Research](#)
- Resources on academic support from the [Academic Success Centre](#)
- Learner support at the [Writing Centre](#)
- Information for [Technical Support/Quercus Support](#)

ACKNOWLEDGEMENT OF TRADITIONAL LANDS

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.