

Techniques in Analytical Chemistry

CHMB16H3 Fall 2023

Picture this: from unraveling medical mysteries to solving enigmatic forensic puzzles, from revolutionizing agriculture to safeguarding our precious environment, and from engineering breakthroughs to venturing into the uncharted territories of space—**Analytical Chemistry has its fingerprints everywhere!**

But that's not all—brace yourself for a course that will transform you into a true chemical virtuoso. Think like a chemist, act like a chemist—it's not just a tagline; it's your passport to unlocking a realm of scientific wonder. We're not just scratching the surface: we're delving deep into the core. Get ready to explore the essence of both timeless classical methodologies and cutting-edge modern techniques that fuel the heart of this captivating field.

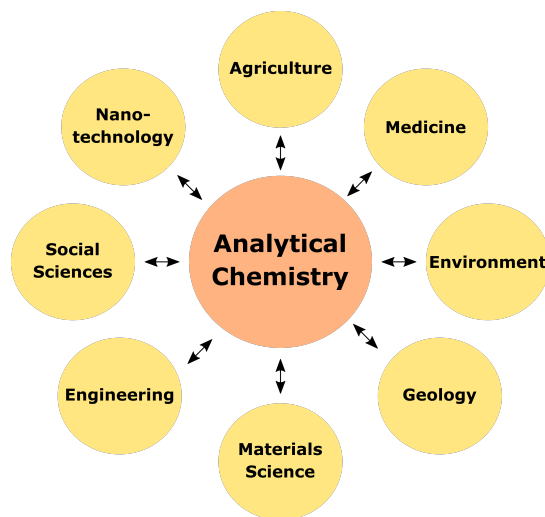
But wait, there's more excitement in store! Get your lab coats on, because you're about to embark on a series of hands-on experiments that will make your inner chemist leap with joy. Feel the thrill as you measure, mix, and analyze like never before. You won't just learn about Analytical Chemistry—you'll live it.

And if that were not enough, brace yourself for a real-world encounter. Collaborate with an industry partner in our community-engaged learning project. Feel the pulse of Analytical Chemistry as you apply your learnings to tackle challenges that matter, challenges that have an impact beyond the classroom. It's not just about equations and formulas; it's about contributing to your community.

At the end of the course, it is our fervent hope that you go away with a solid understanding of the depth and impact of Analytical Chemistry. With an appreciation that will drive you to explore, discover, and innovate further. Get ready to ignite your appreciation for the wonders of the chemical world—because Analytical Chemistry just got a whole lot more exciting!

Welcome to **CHMB16**—Techniques in Analytical Chemistry! We look forward to the semester ahead!

Kris and Ruby



Analytical Chemistry is central to other branches of Chemistry as well as other sciences.

For any concerns or questions as we move through the course together, we can be reached via email (ruby.sullan@utoronto.ca, kris.kim@utoronto.ca).

Ruby Sullan, Lecture Instructor

Office Hours: in-person, Fridays, 14:00–16:00
email: ruby.sullan@utoronto.ca

Kris Kim, Lab Coordinator

Office Hours: via Zoom, Mondays, 13:00–15:00
(further details will be posted on Quercus)
email: kris.kim@utoronto.ca

REQUIRED TEXTBOOK and ONLINE LEARNING PLATFORM

Quantitative Chemical Analysis, 10th Edition, Daniel A. Harris and Charles C. Lucy,

Publisher: MacMillan Learning (you are welcome to use a previous version)

In addition to the textbook, this course will use the online learning platform **Achieve**. For information on how to purchase, how to create your account, how to navigate in Achieve and where to go for support, check this link: [Achieve Student Checklist](#)

It is important that you register in Achieve to access course-relevant materials (problem sets, sample problems, videos and animations). To register, follow the easy steps here: [Course Registration](#). **Course ID: mw2zo7**

- i. Digital-only option, Achieve for Quantitative Chemical Analysis (1-Term Online); ISBN: 9781319384852
- ii. Loose-leaf Version for Quantitative Chemical Analysis 10e & Achieve for Quantitative Chemical Analysis 10e (1-Term Access); ISBN: 9781319425661

Your textbook is also available at the UTSC Bookstore or the Reserves section of the UTSC Library.

METHOD OF EVALUATION

Course Component	Percentage
Laboratory component*	40%
Problem Sets (via Achieve)	5%
Community-engaged project	10%
Midterm Exam	12%
Final Exam	33%
Total	100%

***To pass the course, you have to pass the Laboratory component.**

QUERCUS:

CHMB16 maintains a Quercus web space, which archives a variety of course related information including class announcements, lectures, lab materials, details on the community-engaged learning project, and grades. Class e-mails will be sent periodically to your “utoronto.ca” e-mail account. **To login**, go to: <https://q.utoronto.ca>. Login using your UTORid username and password. Then click on the CHMB16H3 link.

Official announcements regarding test logistics, material covered for each test, and other important announcements will be posted on the CHMB16H3 Quercus site. Please check these postings regularly for important announcements.

EMAIL POLICY:

As part of your training to pursue post-graduate studies or a job/career after your time here at UTSC, we want to ensure you’re best prepared to communicate effectively in a professional environment. Professional communication includes emails. Please use the following guidelines when sending emails:

- Use your UofT account for all your correspondences. If other accounts (Yahoo, Gmail, Hotmail, etc.) are used, your email will be filtered out as spam and may not be received.
- Put “CHMB16” in the subject line followed by the reason for the email and use professional language with a formal greeting.
- Sign the email with your first and last name. Include your student ID number after your name.

Every effort will be made to respond to student emails within 48 hours (M–F) provided that the above protocol is used.

LECTURES:

Lectures (**in-person**): Mondays 9:00–12:00, **SW 143**

Tentative Course Schedule

Week	Date	Topic	Chapter
0		Reading Assignment: Chemical Measurements	1
1	Sep 11	The Analytical Process, Tools of the Trade	2
2	Sep 18	Errors, Statistics	3, 4
3	Sep 25	Quality Assurance and Calibration Methods	5
4	Oct 2	Titration Part 1	7-12
5	Oct 9	Thanksgiving Day/Reading Week	

Week	Date	Topic	Chapter
6	Oct 16	Titration Part 2	7-12
7	Oct 23	Electrochemistry, Potentiometry	14-16
8	Oct 30	Midterm (10 AM–12NN)	
9	Nov 6	Fundamentals of Spectrophotometry	18
10	Nov 13	Applications of Spectrophotometry	19
11	Nov 20	Atomic Spectroscopy, Mass Spectrometry	21-22
12	Nov 27	Analytical Separations	23
13	Dec 4	Chromatography	24-26
14	Dec 5–6	Study Break	
15	Dec 7–20	Final Exam Period	

LABS:

Please note that these are just some of the key details related to the labs this term. Further details will be included in the lab manual that will be posted on Quercus. The laboratory component of CHMB16 is compulsory. **In order to pass the course, you must also pass the lab component.** Your lab experience will consist of TEN(10) experiments. You must complete at least 8/10 experiments (excused absences only). An overview of the schedule of experiments is provided below, though please refer to the "Intro to Labs" document on Quercus for a more detailed breakdown of all things pertaining to the lab.

Lab Schedule:

Dates	Experiment	
September 5 – 8	NO Labs	
September 11 – 15	Intro to volumetric techniques	Together
September 18 – 22	Stats, sampling, and errors	
September 25 – 29	Collection of field samples at the UTSC Farm	
October 2 – 6	Analysis of iron in creek water	Rotation 1
October 9 – 13	Reading Week	
October 16 – 20	Vitamin C analysis	

October 23 – 27	Lead analysis of UTSC Farm	
October 30 – Nov 3	Potentiometric titration of cola	Rotation 2
November 6 – 10	Fluorescence analysis of quinine	
November 13 – 17	HPLC analysis of nucleotides in milk products	
November 20 – 24	Sodium analysis in potato chips	Together

Lab Manual and Notebook:

You **DO NOT** need to purchase a lab manual. All documents related to each experiment will be made available on Quercus. You **DO** need a lab notebook to keep record of all your experiments. The notebooks must be HARD-COVER and BOUND (stitched, not spiral bound) with approximate dimensions of 8.25" × 10.5" inches. They can be purchased at the UTSC bookstore; but you're welcome to purchase a notebook at a merchant of your choice (as long as they meet the above requirements). If you have a lab notebook from a previous course and it has plenty of blank pages remaining, you're welcome to repurpose that, as well. Further details as to how to prepare your notebook will be posted on Quercus.

Laboratory Marking Scheme:

The laboratory component will be worth 40% of your final grade. A detailed breakdown of your lab marks will be posted on Quercus. We understand that there might be instances where you miss a lab due to illness. If this happens, please email Dr. Kim (kris.kim@utoronto.ca) **immediately** to arrange a make-up. You are expected to participate in and complete all 10 experiments in-person.

COMMUNITY-ENGAGED LEARNING PROJECT:

We have the privilege this semester to work with a community partner, specifically, the Toronto Zoo! You will be working in pairs this semester to design an experimental proposal outlining how you would address the challenge that our community partner will pose. The expectation is that you will meet with your partner at least once every two weeks to reflect on what you've learned in lectures and labs and how these concepts and methodologies can be employed towards addressing the community partner's presented challenge. By the end of the semester, you will collectively submit an experimental proposal that will be reviewed by the instructor and community partner and a top proposal will be selected. Select students will be contacted at the end of the term to carry out their experiments as part of a research opportunity in the following semester with the goal of providing the community partner a full report. Further details of the assignment will be provided at the start of term through lectures and announcements on Quercus.

ABSENCE OR MISSED DEADLINES:

For missed term work (labs, assignments, and term tests) due to illness, emergency, or other mitigating circumstances, please follow the procedures outlined below.

Notes:

- The following reasons are not considered sufficient for missed term work: travel for leisure, weddings, personal commitments, work commitments, human error.
- **Missed Final Exams are handled by the Registrar's Office** and should be declared on eService: <http://www.utsc.utoronto.ca/registrar/missing-examination>
- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, you would need to file a petition with the Registrar's Office: <https://www.utsc.utoronto.ca/registrar/term-work>

Accommodations for Illness, Emergency, or Religious Conflicts

For missed work due to ILLNESS, EMERGENCY, or RELIGIOUS CONFLICTS please complete the following process:

1. Complete the Request for **Missed Term Work Form** and **Self-declaration Absence Form**.
2. Declare your absence on **ACORN** (Profile & Settings > Absence Declaration)

Deadline: You must complete the above form **within 5 business days** of the missed work.

Accommodations for Academic Conflicts

For missed term work due to an ACADEMIC CONFLICT (i.e. two quizzes or tests scheduled at the same time), please complete the following process:

Complete the **Request for Missed Term Work Form** choosing "Other" as your reason for missed work and explaining the conflict in the space provided.

Deadline: You should report the conflict **at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier.

Notes:

- **Multiple assignments due on the same day are not considered conflicts.** Accommodations may only be possible in the case of quizzes and tests that are both scheduled during the same discrete period. Back-to-back tests/quizzes are not considered conflicts.
- Students are responsible for keeping their course timetables conflict-free. Students who choose to register in two synchronous courses with overlapping lecture/tutorial/lab schedules may not necessarily be accommodated.

After submitting your documentation:

You should continue to work on your assignments to the best of your ability, as extension accommodations may be as short as one business day, depending on the nature of the illness/emergency.

If an accommodation has been granted but you are unable to meet the conditions of the accommodation (ex. you need a longer extension, or you missed a make-up test), you will need to repeat the missed term work procedure and submit additional forms to request further accommodation. Note that in the case of a missed make-up test, an opportunity to write a second make-up test may not be provided.

Completion of this form does not guarantee that accommodations will be made. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request for accommodation.

Missed Accommodations

If an accommodation is granted but a continued illness/emergency prevents you from meeting the requirements of your accommodation, you must repeat the missed term work procedure to request additional accommodations.

(E.g.) If you miss a make-up midterm, you would need to submit another Request for Missed Term Work Accommodations form.

MIDTERMS AND EXAM POLICY:

Midterms

There will be one 2-hour midterm in this course. The midterm will take place during class (date and time will be announced). **If no acceptable documentation is received (outlined above), you will receive a grade of zero for the midterm.**

Final Exam

There will be a 2.5-hour, **cumulative** exam written during the end of semester exam period. The exact date, time, and further logistics will be announced as soon as they are available. **Please note that if you miss the Final Exam, you must petition the Registrar's Office to write a make-up exam in the next formal exam period.** Check the UTSC Calendar for instructions and deadlines.

Allowed Aids

Details regarding allowable aids for each assessment will be provided on Quercus.

Policy on Missed Tests

Please note that in the UTSC Calendar it states: "You cannot petition to withdraw from a course on the grounds that no work was returned to you before the last day to withdraw without academic penalty if this is the result of your having been given an extension to complete your work for reasons relating to you and not the rest of your class."

MENTAL HEALTH RESOURCES:

University life is tough and the pandemic has only introduced even further challenges. If you feel that you need to seek help for yourself or someone you care about, you may wish to contact the Toronto Distress Centre (416-408-4357), Good2Talk (866-925-5454), or [UTSC Health and Wellness Centre](#). UTSC Health and Wellness is currently offering same day appointments, which can be booked by either calling 416-287-7065 or emailing at health-services@utsc.utoronto.ca.

ACCESSIBILITY:

Students with diverse learning styles and needs are welcome in this course. If you require accommodations for a disability, or have any accessibility concerns about the course, the online classroom, or course materials, please contact us and or the Accessibility Services as soon as possible: (416) 287-7560 or ability@utsc.utoronto.ca

ACADEMIC INTEGRITY:

Academic integrity is one of the cornerstones of the University of Toronto. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness, and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently. Detailed information about how to act with academic integrity, the Code of Behaviour on Academic Matters, and the processes by which allegations of academic misconduct are resolved can be found online: <http://www.artsci.utoronto.ca/osai/students> According to Section B of the University of Toronto's Code of Behaviour on Academic Matters <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm> which all students are expected to know and respect, it is an offence for students to:

- To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted citations in their work.
- To obtain unauthorized assistance on any assignment.
- To provide unauthorized assistance to another student. This includes showing another student completed work.
- To submit their own work for credit in more than one course without the permission of the instructor.
- To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an unauthorized aid in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the [Code of Behaviour on Academic Matters](#).