



Techniques in Analytical Chemistry (CHMB16H3)
Summer 2024 Syllabus
University of Toronto at Scarborough

Dear Students,

Welcome to CHMB16 – Techniques in Analytical Chemistry! I hope that throughout the lectures and weekly labs in this course, you'll be able to see and experience how analytical chemistry as a subdiscipline is an exciting field with far-reaching applications, including forensic science, agriculture, environmental science, space exploration, biomedical science, even in virology and vaccine development! In this course, you will be taught to *think* like and *work* like an analytical chemist. We will cover both the fundamental and practical aspects of the methodologies and instrumentation—classical and modern — widely used in the field. Topics will range from optimization of sample preparation methods, consideration of accuracy and precision using errors and statistical analyses, and applications of electrochemistry, spectroscopy, and chromatography as quantitative and qualitative tools. We hope the discussions in this course will help you develop an appreciation for the depth and importance of analytical chemistry and its widespread applications.

Below is the syllabus for this course. Please read the course syllabus carefully to understand the learning expectations and assessment methods for this course. That said, please don't hesitate to reach either Dr. Kim (kris.kim@utoronto.ca) or Dr. Jenne via email (amy.jenne@utoronto.ca) if you have any concerns or questions as we move through the course together.

Looking forward to the semester ahead,

Kris Kim (May – June)
(Instructor and Lab Coordinator)
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Amy Jenne (July – August)
(Instructor and Lab Coordinator)
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EMAIL POLICY:

Believe it or not, your time here at UofT will fly by! 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. This includes the emails that we will rely heavily on during these times!

Please use the following guidelines when sending emails:

- i. 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.
- ii. Put "CHMB16" in the subject line followed by the reason for the email and use professional language with a formal greeting.
- iii. 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.

REQUIRED TEXTBOOK:

- **Quantitative Chemical Analysis, 10th Edition**, Daniel A. Harris and Charles C. Lucy, Publisher: MacMillan Learning (you're welcome to use a previous version)
- **Achieve** (optional, only if you want access to extra practice problems)
 - Follow this link to learn more on how to get access to Achieve problems:
<https://sites.google.com/macmillan.com/achievestudentchecklist-ss/home?authuser=1>

ASSESSMENT AND GRADING:

Course Component	Percentage
Laboratory component*	40%
Community-engaged project (written reflection)	10%
Midterm	16%
Final Exam	34%
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: grades, class announcements, lectures, and lab materials. 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.

LECTURES:

- Tuesdays from 2 – 4 PM (IC220)
- Thursdays from 1 – 3 PM (KW110)

OFFICE HOURS:

Office hours will be offered for 2 hours per week. Exact times will be announced on Quercus.

LABS:

All labs will take place on Wednesdays (1 – 5 PM). 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 and complete at least 8/10 experiments (excused absences only).**

Lab Schedule:

This course will have weekly labs (10 labs in total). A brief outline of the lab schedule is shown below, a more detailed breakdown can be found in the lab manual (posted on Quercus).

Date (all labs are on Wednesdays 1-5 PM)	Experiment	PRA#s
May 15	EXP 1: intro to volumetric techniques	1, 2, 3
May 22	EXP 2: Stats, sampling, and errors	1, 2, 3
May 29	EXP 3: creek water collection and preparation	1, 2, 3
June 5	EXP 4: analysis of iron in creek water EXP 5: vit C titration EXP 6: fluorescence analysis of quinine	1 2 3
June 12	EXP 4: analysis of iron in creek water EXP 5: vit C titration EXP 6: fluorescence analysis of quinine	2 3 1
June 19	READING WEEK (no lab)	
June 26	EXP 4: analysis of iron in creek water EXP 5: vit C titration EXP 6: fluorescence analysis of quinine	3 1 2
July 3	EXP 7: potentiometric analysis of cola EXP 8: zinc analysis in breakfast cereal EXP 9: nucleotides in milk	1 2 3
July 10	EXP 7: potentiometric analysis of cola EXP 8: zinc analysis in breakfast cereal EXP 9: nucleotides in milk	2 3 1
July 17	EXP 7: potentiometric analysis of cola EXP 8: zinc analysis in breakfast cereal EXP 9: nucleotides in milk	3 1 2
July 24	EXP 10: sodium analysis in potato chips	1, 2, 3

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. Further details as to how to prepare your notebook will be made available in the lab manual posted on Quercus. We recommend you find a lab notebook that is bound so that all your labs are kept in one place and that the notebook has 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 their 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.

Laboratory Marking Scheme

The laboratory component will be worth 40% of your final grade. A detailed breakdown of your lab marks will be provided in the Lab Manual posted 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](#)**
2. **Declare your absence** on [ACORN](#) (Profile & Settings > Absence Declaration)

Deadline: You must complete the above form **within 1 day** of the missed work.

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

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.

MIDTERMS AND EXAM POLICY:

Midterm

The 2-hour midterm will take place in-class and in-person in mid-late June. The exact date/time will be confirmed early in the semester and announced in lecture and through Quercus.

Final Exam

There will be a 3-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.

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](#).

EQUITY, DIVERSITY, AND INCLUSION POLICY

The University of Toronto Scarborough 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. UTSC does not condone discrimination or harassment against any persons or communities.

Kindness Policy

CHMB16 is an inclusive and accepting space. There will be zero tolerance for inappropriate behaviour of any kind. This includes to your instructors, TAs, and fellow classmates. We will be treating you with kindness and respect and please ask that you do the same. Remember we are all here to learn together, and we do not know what other people are going through in their lives.

CHMB16H3 Lecture Schedule (Tentative):

Week	Week of...	Topic(s)	Suggested Readings (Chapters from Harris)
1	May 6	<ul style="list-style-type: none"> What is Analytical Chemistry? Tools of the Trade 	0, 1, 2
2	May 13	<ul style="list-style-type: none"> Sources of Error Treatment of Error 	3 & 4
3	May 20	<ul style="list-style-type: none"> Statistical Data Treatment Sampling, Standardization, and Calibration 	4 & 5
4	May 27	<ul style="list-style-type: none"> Titrations in Analytical Chemistry Acid Base Titrations 	7 & 11
5	June 3	<ul style="list-style-type: none"> Buffers Polyfunctional Acid-Base Titrations 	9, 10, 11
6	June 10	<ul style="list-style-type: none"> Complexation Titrations Intro to Electrochemistry 	12, 14
7	June 17	READING WEEK (between June 20-24)	
8	June 24	<ul style="list-style-type: none"> Electrochemistry Potentiometry 	14, 15, 16
9	July 1	<ul style="list-style-type: none"> Intro to Spectrochemical Methods Optical Spectroscopy 	18, 20
10	July 8	<ul style="list-style-type: none"> Molecular Absorption Spectroscopy Fluorescence Spectroscopy 	18, 19, 20
11	July 15	<ul style="list-style-type: none"> Atomic Spectroscopy Mass Spectrometry 	21, 22
12	July 22	<ul style="list-style-type: none"> Separation Science and Intro to Chromatography 	23
13	July 29	<ul style="list-style-type: none"> Gas chromatography High-Performance Liquid Chromatography 	24, 25