Techniques in Analytical Chemistry (CHMB16H3)
Summer 2022 Syllabus
University of Toronto at Scarborough

Dear Students,

Welcome to CHMB16 – Techniques in Analytical Chemistry! I hope that everyone is safe and well, both physically and mentally, as we continue to readjust to in-person teaching and learning.

Analytical Chemistry is an exciting field with far-reaching applications— forensics, agriculture, environment, space exploration, and 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 analysis, 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 me via email (kris.kim@utoronto.ca) if you have any concerns or questions as we move through the course together.

Looking forward to the semester ahead,

Kris Kim
(**Instructor and Lab Coordinator**)
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email: kris.kim@utoronto.ca

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, but recommended for preparing for midterm/final)
    - 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)	15%
Midterm	15%
Final Exam	30%
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 1 – 3 PM (IC204)
- Thursdays from 1 – 3 PM (IC200)

OFFICE HOURS:

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

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.** We are operating at 50% capacity for in-person labs this Summer term. Your lab experience will consist of NINE (9) experiments: FIVE (5) in-person labs + FOUR (4) virtual labs.

Please note that this schedule is subject to change depending on changes to public health guidelines.

Lab Schedule:

This course will have weekly labs (9 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).

Dates	EXP Title	Rotations
May 18 & May 25	Intro to vol tech (in person)	Rotation 1
	Stats sampling and errors (virtual)	
June 1 & June 8	Iron analysis of creek water (in person)	Rotation 2
	Zinc FAAS (virtual)	
June 15 & June 29	Vitamin C titration (in person)	Rotation 3
	Fluorescence analysis of quinine (virtual)	
July 6 & July 13	Potentiometric analysis of cola (in person)	Rotation 4
	Ion separation and EDTA titration (virtual)	
July 20 & July 27	Nucleotides in milk (in person)	Rotation 5

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 (for both in-person and virtual labs). 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 small groups (2-3) 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 group members 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 on June 28th.

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.

CHMB16H3 Lecture Schedule (Tentative):

Week	Dates	Topic(s)	Suggested Readings (Chapters from Harris)
1	May 9-13	• What is Analytical Chemistry? • Tools of the Trade	0, 1, 2
2	May 16-20	• Sources of Error • Treatment of Error	3 & 4
3	May 23-27	• Statistical Data Treatment • Sampling, Standardization, and Calibration	4 & 5
4	May 30 – June 3	• Titrations in Analytical Chemistry • Acid Base Titrations	7 & 11
5	June 6-10	• Buffers • Polyfunctional Acid-Base Titrations	9, 10, 11
6	June 13-17	• Complexation Titrations • Intro to Electrochemistry	12, 14
7	June 20 – 24	**READING WEEK (between June 21-25)**	
8	June 27 – July 1 (June 30 – Presidential Day; July 1 – Canada Day)	• Electrochemistry • Potentiometry	14, 15, 16
9	July 4-8	• Intro to Spectrochemical Methods • Optical Spectroscopy	18, 20
10	July 11-15	• Molecular Absorption Spectroscopy • Fluorescence Spectroscopy	18, 19, 20
11	July 18-22	• Atomic Spectroscopy • Mass Spectrometry	21, 22
12	July 25-29	• Separation Science	23
13	August 1-5 (August 1 – Civic Holiday)	• Separation Science and Intro to Chromatography	23
14	August 8-12	• Gas chromatography • High-Performance Liquid Chromatography **August 10 is last day of class**	24, 25