



**Techniques in Analytical Chemistry (CHMB16H3)**  
**Summer 2021 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 all continue to cope with the pandemic.

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.

As you are all aware, this course will be offered FULLY online this Summer 2021 term, this includes the lab component. While the labs will be facilitated online (further details outlined below), we hope to continue to offer you ample opportunities to build skills as an analyst, while the lecture component will provide opportunities to discuss the principles of the subject matter. Below is the syllabus for this course. Please read the course syllabus carefully to understand the learning expectations and assessment methods for this course. As you may expect, the course will look and feel different compared to prior semesters/years as we work towards engaging in meaningful chemistry related discussions in an online environment.

That said, please don't hesitate to reach me via email ([kris.kim@utoronto.ca](mailto: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](mailto: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:**

- **Fundamentals of Analytical Chemistry, 9th Edition**, Douglas A. Skoog, Donald M. West, F. James Holler, and Stanley R. Crouch, Publisher: Brooks/Cole, Cengage Learning.
  - eBook available here:
    - <https://www.cengage.com/shop/ISBN/9780495558286?cid=APL1>

**ASSESSMENT AND GRADING:**

<b>Course Component</b>	<b>Percentage</b>
Laboratory component*	40%
Midterm	25%
Final Exam	35%
<b>Total</b>	<b>100%</b>

*\*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 & Thursdays from 2 – 4 PM (Eastern time)

As we engage in online/distance learning, it can be helpful to have a sense of rhythm and structure to our days. Lectures will be delivered synchronously (meaning, they'll be delivered live on Bb Collaborate) at the aforementioned times. These lectures will also be recorded, as well, for those who cannot attend. Lecture recordings will be left up and available for the whole term.

**OFFICE HOURS:**

Office hours will be offered for 3 hours per week on Bb Collaborate. 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 FULLY online this Fall term and your lab experience will consist of TEN (10) virtual exercises. While everything will be completed online, we will maintain the lab schedule to maintain a sense of rhythm and regularity in the course.

*Lab Schedule:*

Labs will be run asynchronously, but you will be required to complete the “in-lab” components within a period of 3+ days each week. These 3+ days will be between 12:00 AM Tuesday and 1:00 PM Friday on the weeks that labs are taking place. Labs will begin during the week of May 17<sup>th</sup>.

*Lab Manual and Notebook:*

You **DO NOT** need to purchase a lab manual. Relevant lab procedures will be made available to you through Quercus. You **DO** need a lab notebook to keep record of all your virtual experiment. It is important that you continue to build effective note keeping habits through these times as you will be expected to know how to prepare and manage your experimental results in a lab notebook in future

courses. Further details as to how to prepare your notebook will be made available in the lab manual posted on Quercus.

Since the course will be fully online this term, your lab notebook does not have to be hard-cover. You're welcome to use any notebook you wish, but we recommend you use one 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 usually be purchased at the UTSC bookstore; however, given the circumstances, students are free to purchase their books at a merchant of their choice (so 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 5 business days** of the missed work.

## **Accommodations for Academic Conflicts, Time Zone 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:

1. 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.

*Note: 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.*

*Note: 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 1 x 90-minute midterm in this course. The midterm will take place online on Quercus during class time on **June 29<sup>th</sup>** (from 2:00 – 3:30 PM, Eastern time). **If no acceptable documentation is received (outlined above), you will receive a grade of zero for that test.**

**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**

With more assessments moved into an online format, we trust that you will uphold academic integrity when taking assessments (more details regarding academic integrity below). 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](mailto: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](mailto: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 Skoog)
1	May 10 – 14	<ul style="list-style-type: none"> <li>What is Analytical Chemistry?</li> <li>Tools of the Trade</li> </ul>	1 & 2
2	May 17 – 21 (May 21 – Presidential Day)	<ul style="list-style-type: none"> <li>Sources of Error</li> <li>Treatment of Error</li> </ul>	5 & 6
3	May 24 – 28 (May 24 – Victoria Day)	<ul style="list-style-type: none"> <li>Statistical Data Treatment</li> <li>Sampling, Standardization, and Calibration</li> </ul>	7 & 8
4	May 31 – June 4	<ul style="list-style-type: none"> <li>Titrations in Analytical Chemistry</li> <li>Acid Base Titrations</li> </ul>	13 & 14
5	June 7 – 11	<ul style="list-style-type: none"> <li>Buffers</li> </ul>	9
6	June 14 – 18	<ul style="list-style-type: none"> <li>Polyfunctional Acid Titrations</li> <li>Complexation Titrations</li> </ul>	15 & 17
7	June 21 – 25	<b>READING WEEK (between June 22 – 26)</b>	
8	June 28 – July 2 (July 1- Canada Day; July 2 – Presidential Day)	<ul style="list-style-type: none"> <li>Electrochemistry</li> <li>Potentiometry</li> </ul>	18, 19, 21
9	July 5 – 9	<ul style="list-style-type: none"> <li>Intro to Spectrochemical Methods</li> <li>Optical Spectroscopy</li> </ul>	24 & 25
10	July 12 – 16	<ul style="list-style-type: none"> <li>Molecular Absorption Spectrometry</li> <li>Molecular Fluorescence Spectroscopy</li> </ul>	26 & 27
11	July 19 – 23	<ul style="list-style-type: none"> <li>Atomic Spectroscopy</li> <li>Mass Spectrometry</li> </ul>	28 & 29
12	July 26 – 30	<ul style="list-style-type: none"> <li>Separation Science</li> </ul>	31
13	August 2 – 6 (August 2 – Civic Holiday)	<ul style="list-style-type: none"> <li>Intro to Chromatography</li> </ul>	32 & 33
14	August 9 – 13	<b>August 11 is last day of class</b>	
14	August 12 – 14	<b>Study Break</b>	
14 -	August 16 – 29	<b>Final Exam Period</b>	