

## Techniques in Analytical Chemistry CHMB16H3 Fall 2021

Welcome to CHMB16–Techniques in Analytical Chemistry! We 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—medicine, forensics, agriculture, environment, engineering, even in space exploration! In this course, you will be taught to *think like* and *act like* a chemist. We will cover both the fundamental and practical aspects of the methodologies and instrumentation widely used in the field. Topics range from sample preparation to errors and statistics to electrochemistry, spectroscopy, and chromatography. While the lab will give you ample opportunities to act like an analytical chemist, the lecture part will teach you the basic principles behind each technique and analytical approaches. Our hope is that this course will develop in you an appreciation for the depth and impact of Analytical Chemistry.

This course will be offered in a hybrid delivery (i.e. both online and in-person). Lectures will be given in both synchronous and asynchronous manner. The labs will also be facilitated online with some experiments requiring in-person attendance (further details outlined below). Through the labs, we hope to continue to offer you ample opportunities to build skills as an analytical chemist, while the lecture component will provide opportunities to delve into the principles of the subject matter. Below you will find important information about the course. Please read the course syllabus carefully to understand the learning expectations and assessment methods.

That said, please don't hesitate to reach us via email ([ruby.sullan@utoronto.ca](mailto:ruby.sullan@utoronto.ca), [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,

Ruby Sullan

**Lecture Instructor**

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Kris Kim

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*\*Both Profs. Kim and Sullan are working off campus until further notice*

## **TEXTBOOK and ONLINE LEARNING PLATFORM**

In addition to the textbook, **Quantitative Chemical Analysis**, 10th Edition, 2020, Daniel A. Harris and Charles C. Lucy, Publisher: MacMillan Learning, this course will use the online learning platform, **Achieve**. For information on using Achieve, how to register in the correct Achieve course, FAQs, tech support etc., 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](#)

**Achieve includes access to the full ebook for a 4 year period.** Note that you have the following textbook+Achieve options:

**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

**iii. Bound Version** for Quantitative Chemical Analysis 10e & Achieve for Quantitative Chemical Analysis 10e, 1-Term Access, ISBN: 9781319425203

## **METHOD OF EVALUATION**

<b>Course Component</b>	<b>Percentage</b>
Laboratory component*	40%
Midterm Exam	20%
Final Exam*	35%
Problem Set	5%
Total	100%

*\*To pass the course, **you have to pass the Laboratory component**. A detailed breakdown of the labs and what they entail can be found on Quercus.*

## **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.

## **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: Mondays, Tuesdays, Thursdays, 11:00–12:00

As we continue to engage in online/distance learning, it can be helpful to have a sense of rhythm and structure to our days. Lectures will be delivered mostly synchronously (via zoom) at the aforementioned times. Details on how to access the lectures can be found on Quercus. 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.

## **LABS:**

Please note that these are just some of the key details related to the labs this term. A more comprehensive overview of the labs (and expectations) can be found on Quercus. The

laboratory component of CHMB16 is compulsory. **In order to pass the course, you must also pass the lab component.** Throughout this semester, we will (tentatively) cover 9 experiments (5 virtual and 4 in-person). Please note that the lab schedule may change depending on the circumstances (especially regarding COVID numbers) as the semester progresses. A tentative overview of the schedule of experiments is provided below (you can find a more detailed breakdown of who your TAs are in addition other details on Quercus). **Labs will be run synchronously for both online and in-person labs.**

*Lab Schedule:*

Mode	EXP #	Dates	Experiment
NO LABS (September 7 - 10)			
NO LABS (September 13 - 17)			
Online	1	September 20 - 24	Intro to techniques (online)
In-person	2	September 27 - October 1	Intro to techniques
Online	3	October 4 - 8	Stats and sampling
READING WEEK (October 11-15)			
In-person	4	October 18 - 22	UV-vis analysis of creek water
Online	5	October 25 - 29	FAAS analysis of zinc tablets
In-person	6	November 1 - 5	Redox/back titration of vitamin C
Online	7	November 8 - 12	Fluorescence analysis of quinine
In-person	8	November 15 - 19	Potentiometric analysis of cola
Online	9	November 22 - 26	Ion separation and complexometric titration

*Lab Manual and Notebook:*

Relevant lab procedures will be made available to you through Quercus. You DO NOT need to purchase a lab manual. You **DO** need a lab notebook to keep record of all your virtual experiment. Further details as to how to prepare your notebook and what to include will be made available on Quercus.

You are required to use a HARD-COVER and BOUND (stitched, not spiral bound) notebook with approximate dimensions of 8.25" × 10.5" inches. Notebooks can 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.

### **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. **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 × 90-minute midterm in this course. The midterm will take place online on Quercus (date and time will be announced). **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](#).

### Tentative Course Schedule

Week	Date	Topic	Chapter
<b>0</b>		Reading Assignment: Chemical Measurements	1
<b>1</b>	Sep 7-9	The Analytical Process, Tools of the Trade	2
<b>2</b>	Sep 13-16	Errors, Statistics	3, 4
<b>3</b>	Sep 20-23	Quality Assurance and Calibration Methods	5
<b>4</b>	Sep 27-30	Titrations Part 1	7-12
<b>5</b>	Oct 4-7	Titrations Part 2	7-12
<b>6</b>	Oct 11-14	<b>Reading Week</b>	
<b>7</b>	Oct 18-21	Electrochemistry, Potentiometry	14-16
<b>8</b>	Oct 25-28	Electroanalytical Techniques	17
<b>9</b>	Nov 1-4	Fundamentals of Spectrophotometry	18
<b>10</b>	Nov 8-11	Applications of Spectrophotometry	19
<b>11</b>	Nov 15-18	Atomic Spectroscopy, Mass Spectrometry	21-22
<b>12</b>	Nov 22-25	Analytical Separations	23
<b>13</b>	Nov 29-Dec 2	Chromatography	24-26
<b>14</b>	Dec 6-8	<b>Study Break</b>	
<b>15</b>	Dec 9-21	Final Exam Period	