

CHEM 154: Chemistry for Engineering

What is this course about?

This course is an introduction to important principles of chemistry and their application in relevant areas of engineering. The content is divided into three parts: bonding and matter; thermodynamics and kinetics; and electrochemistry.

The topics covered in this course have been carefully chosen for their relevance to engineering. For example, polymer properties and synthesis, kinetics and thermodynamics form a foundation for Materials, Mechanical, Civil, and Chemical and Biological Engineers.

The lecture part of the course will be delivered in person but the laboratory part will be delivered remotely using Zoom. Laboratory components will be delivered synchronously so students must attend during their scheduled lab periods.

Who is teaching this course?

Course Instructors

Amani Hariri Section 166 – CHEM B250 T/Th 11:00 – 12:20 Office: CHEM A127 Email: amaniah@chem.ubc.ca Office hours: TBA (Also available by appointment)	Dan Bizzotto Section 133 – HEBB 100 T/Th 15:30 – 16:50 Office: AMPEL 342 Email: bizzotto@chem.ubc.ca Office hours: TBA (Also available by appointment)	Keng Chou Section 177 – CIRS 1250 T/Th 12:30 – 13:50 Office: CHEM D348 Email: kcchou@chem.ubc.ca Office hours: TBA (Also available by appointment)
Vishakha Monga (Laboratory Director) Office: B470A Chemistry Building Email: freshman154@chem.ubc.ca	All laboratories are virtual and are performed synchronously during the periods listed to the right. All students must attend the labs during their scheduled lab periods.	Monday 14:00 – 17:00 Wednesday 9:00 – 12:00
Tutorials (new for 2025/6) CHEM C126, Mon-Fri, 5-6pm MCLD 3002, Mon, 5-6pm MCLD 2012, Tues-Fri, 5-6pm (6 most popular will be booked)	Tutorial sections will be available many days of the week (to be determined by Canvas Survey). Attendance is not mandatory, but highly recommended.	Worksheet questions will be 'assigned' and answers worked out during the tutorial.

Note: times listed are those in Vancouver, Canada.

Who can help me when I have questions?

Your notes, a textbook and the Internet are all good places to start looking for answers to questions. If you can't find your answers there, please direct your questions about course content to our message board (Piazza), where other students, course instructors or teaching assistants will be able to answer them. **Please direct all lab-related questions to the discussion board on the CHEM 154 Online Lab Canvas site, not to Piazza.** Remember that instructors are ready to answer questions during their posted office hours, and students can attend the office hours of any instructor. Please take full advantage of these resources.

Administrative issues concerning the course (missed exams or quizzes, academic accommodations, etc.) should be emailed to your instructor.

What do I need to succeed in CHEM 154?

Course Website

When you login to Canvas <https://canvas.ubc.ca/> you should see three CHEM 154 related sites. One is specific for your lecture section and contains section-specific content, such as announcements, lecture notes, recordings of lectures (if your instructor has chosen this option), and mechanisms for submitting worksheets for grading. Another is the “All Lectures” site containing information relevant to all the lecture sections, such as interesting links (including that for Achieve), course-wide announcements, lecture videos, assignments (quiz and Achieve), and digital versions of the CHEM 154 lecture notes and worksheets. The third site is specifically for the laboratory component of CHEM 154.

Achieve Access Codes (required)

You are required to purchase an Achieve access code for the lecture component of the course. This is used to assign graded homework, is called “Achieve for OpenStax General Chemistry” and costs ~\$40. Ultimately, this code needs to be purchased through the UBC Bookstore either in person or online (keep your receipt because you may need it to verify your purchase when accessing Achieve for the first time), or by selecting the Achieve link from the lecture course Canvas site. You **must** use the UBC Bookstore to purchase the Achieve access codes because they are specially linked to the corresponding CHEM 154 Canvas site. Purchase details are also posted on the All Lectures Canvas site.

Calculator (required)

During examinations you **will not** be able to use a computer or smart phone as a calculator. Thus, you require a separate calculator for this purpose. Any calculator with basic functionality is acceptable provided it **does not** have wireless communication capabilities.

IT Infrastructure (required)

Because the laboratory component will be delivered entirely remotely, the IT infrastructure listed below is required:

- 1) Laptop or desktop (possibly a good tablet) with relatively recent operating system
- 2) Good Internet connectivity (stable with reasonable bandwidth)
- 3) Scanner or smart phone or other device capable of taking one or more images of worksheets (for example) and converting these to a single PDF document for uploading.

Online Textbooks (optional)

Students desiring a more textbook-like presentation of the course material may find the following online resources useful. The first is tailored for CHEM 154, and the second is a standard first year chemistry textbook

- 1) https://chem.libretexts.org/Courses/University_of_British_Columbia/UBC_CHEM_154%3A_Chemistry_for_Engineering
- 2) [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_\(Petrucci_et_al.\)](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.))

Laboratory

Laboratory information, including important dates, notes, and experiments, is posted on the CHEM 154 Online laboratory Canvas site. This site also contains a link for purchasing your required access code for the laboratory simulation software at a cost of \$45.00. Any laboratory questions should be directed to freshman154@chem.ubc.ca.

What will I be able to do by the end of term?

We have created a list of course goals which you should keep in mind throughout the course. At the end of the term, you should be able to:

- Explain the organization of the periodic table and how atomic properties vary by their location in the periodic table.
- Draw Lewis structures for molecules containing main group elements and predict their three-dimensional geometry.
- Describe a molecule's polarity using the concepts of electronegativity and valence-shell-electron-pair repulsion (VSEPR).
- Compare and contrast different physical states of matter based on their molecular structure.
- Use the ideal gas law and the van der Waals equation to calculate different variables of pure gases and mixtures of gases both ideal non-ideal.
- Use the principles of thermodynamics to determine the spontaneity of a chemical process
- Qualitatively and quantitatively describe the speed of single-step and multi-step reactions.
- Qualitatively and quantitatively describe how systems in equilibrium change upon exposure to external stress.

What will we cover and when?

The following is a tentative schedule for the term. Please be advised that this schedule may change depending on the pace we move through the material.

Week	Topics	Units
1	Introductions / The periodic table	2
2	Periodic trends / Lewis structures	2 / 3
3	Lewis structures	3
4	VSEPR theory / Intermolecular forces	3 / 4
5	Phases of matter	4
6	Polymers	5
7	Polymers	5
8	Gases / Introductory thermodynamics	6 / 7
9	Enthalpy	7
10	Spontaneity	8
11	Equilibrium	9
12	Electrochemistry	10
13	Kinetics	11

How will my grade be determined?

Your final grade will be a reflection of your proficiency in exams, assignments, quizzes and activities, and laboratory work. The Faculty of Science requires **PASSING GRADES FOR EACH OF THE LABORATORY AND LECTURE COMPONENTS INDIVIDUALLY** in order to obtain a passing grade for the course. The grade for the lecture component is calculated from the 85% of marks for quizzes and activities, Achieve assignments, and exams so one must obtain at least 42.5/85 to receive a passing lecture grade.

The allocation of marks for CHEM 154 will be as follows:

Section specific activities (e.g., clickers, extra credit Achieve assignments)	5%
Graded Achieve assignments (6 in total, top 5 will be used)	10%
Midterm #1	12.5%
Midterm #2	12.5%
Final exam	45%
Laboratory	15%

The two midterm exams are tentatively scheduled for **Friday, October 17 from 18:30-19:30** (Vancouver time) and **Friday, November 7 from 18:30-19:30** (Vancouver time). The midterm and final exams will be written in person.

Learning activities

Students will be expected to participate in a number of learning activities, including: participating in class discussions, asking questions, answering questions, completing worksheets, listening to lectures, taking notes, answering “clicker” questions, working with peers, completing preparatory readings and watching preparatory videos, completing homework assignments, participating in tutorial, and completing laboratory activities.

Are there any important dates I should know about?

Assignments

Periodic assignments for selected content modules will be posted on Achieve. Half (6) of the assignments will be graded (100 pts each) and the other half (6) will be for extra credit (1 pt). Achieve assignments will generally be posted at 0:00 (Vancouver time) on Monday and be due the following Sunday by 23:59 (Vancouver time) (~6-7 days later). Following the due date, an ungraded, practice version of each assignment will be made available for students to use for exam preparation or skill-honing, as necessary. Where possible, students will be notified on Canvas and in class when a new assignment is posted.

Your first Achieve extra credit assignment is a high-school review on stoichiometry due on **Sunday, September 14th**.

Other dates

The dates below might have changed since this syllabus was written. For official dates, please check the University calendar at: <http://www.calendar.ubc.ca/vancouver/>

Sept. 15 th - 2025	Labs begin this week
Sept. 11 th - 2025	“Relevance of this course to engineering” Bonus assignment on Canvas due
Sept. 11 th - 2025	First Achieve Assignment (Stoichiometry) due by 23:59
Sept. 16 th - 2025	Last day for withdrawal from most Winter Session Term 1 courses
Oct. 17 th – 2025 (tentative)	Midterm Exam (18:30-19:30)
Oct. 24 th - 2025	Last day for withdrawal with a W standing
Nov. 7 th - 2025 (tentative)	Midterm Exam (18:30-19:30)
Dec. 5 th - 2025	Last day of classes
Dec. 10 th -21 st - 2025	Final Examination Period

What are the rules?

Academic Honesty

Students are expected to follow the University of British Columbia academic integrity guidelines, which can be found at <https://academicintegrity.ubc.ca>. According to the guidelines, cheating includes falsification of any material subject to academic evaluation, including research data; use of or participation in unauthorized collaborative work; use or possession in an examination of any materials (including devices) other than those permitted by the examiner; use, possession, or facilitation of unauthorized means to complete an examination (e.g., receiving unauthorized assistance from another person, or providing that assistance); and dishonest practices that breach rules governing examinations or submissions for academic evaluation. Plagiarism includes the presentation or submission of the work of another person, without citation or credits, as the student's own work. Violations of these guidelines may result in academic discipline ranging from a zero mark on an assignment up to expulsion from the university.

Group work policies

The aforementioned policies on cheating and plagiarism should not discourage you from participating in scientific discussions with your peers. Your academic experience at the University of British Columbia will be enriched by engaging in discussions for the purpose of increasing your understanding of the subject matter. Assignments that are to be done individually are expected that you complete these by working individually and writing in your own words. It is unacceptable to have others write assignments on your behalf, to write assignments on others' behalf, to copy other students' work, or to allow other students to copy your work.

CHEM 154 and Academic Integrity, Generative Artificial Intelligence, and Copyright

What is academic integrity?

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work; nor should you help others to do the same. For example, it is prohibited to: share your past assignments and answers with other students; work with other students on an assignment when an instructor has not expressly given permission; or spread information through word of mouth, social media, websites, or other channels that subverts the fair evaluation of a class exercise, or assessment.

Why is academic integrity important?

As a student, your number one task is to learn new things. Just like your professors, however, you are a member of a university scholarly community. As a part of this community, you are responsible for engaging with existing knowledge and contributing ideas of your own. Academics—including you!—build knowledge through rigorous research that expands on the contributions of others, both in the faraway past and around the world today. This is called scholarship. Academic integrity, in short, means being an honest, diligent, and responsible scholar. This includes:

- Accurately reporting the results of your research, e.g., when collecting data in a lab.
- Taking exams without cheating.
- Completing assignments independently or acknowledging collaboration when appropriate. Collaboration through group work is an effective way to learn. I will clearly indicate when you should collaborate, for example during in-class group work and on some online homework assignments.
- Creating and expressing your own original ideas.
- Engaging with the ideas of others, both past and present, in a variety of scholarly platforms such as research journals, books by academics, lectures, etc.
- Explicitly acknowledging the sources of your knowledge, especially through accurate citation practices.

What should I know about sharing course materials?

We are working hard to provide all the materials you need to succeed in this course. In return, please respect our work. All assignment instructions, quiz questions and answers, discussion questions, announcements, PowerPoint slides, audio/video recordings, Canvas modules, and any other materials provided to you by the Teaching Team or in the textbook are for use in this course by students currently enrolled [course/section]. It is *unacceptable* to share any of these materials beyond our course, including by posting on file-sharing websites (e.g., CourseHero, Google Docs). It is *unacceptable* to copy and paste sentences from the textbook (e.g., definitions) into for-profit software (e.g., Quizlet) for use in studying. Respect the Teaching Team and textbook authors' intellectual property, and follow [copyright law](#).

What happens when academic integrity is breached?

Violations of academic integrity (i.e., misconduct) includes any conduct by which a student gains or attempts to gain an unfair academic advantage or benefit thereby compromising the integrity of the academic process, or helping or attempting to help another person commit an act of academic misconduct or gain, or attempt to gain, an unfair academic advantage. Academic misconduct leads to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred for consideration for academic discipline. Careful records are kept to monitor and prevent recurrences. Any instance of cheating or taking credit for someone else's work, whether intentionally or unintentionally, can and often will result in at minimum a grade of zero for the assignment, and these cases will be reported to the Head of the Department of Chemistry and Associate Dean Students of the Faculty of Science.

What support is available?

Feel free to ask me about academic integrity. Part of my job is to guide your growth as a scholar, and I would much rather you ask for clarification than unintentionally engage in academic misconduct, which has serious consequences. If you are unsure about what constitutes academic misconduct, please reach out to me or other instructors by e-mail.

Sometimes students who are experiencing a lot of stress feel the only way to deal with a situation is to cheat. Please do not do this. Talk to your instructors, and I am sure we can work something out together.

To help you learn your responsibilities as a scholar, please read and understand UBC's expectations for academic honesty in the UBC Calendar: "[Academic Honesty](#)," "[Academic Misconduct](#)," and "[Disciplinary Measures](#)". Read and reflect on the [Student Declaration and Responsibility](#).

For written assignments and help with plagiarism and citation, see the [Centre for Writing and Scholarly Communication](#).

Additional resources for learning with integrity can be found on the UBC [Academic Integrity Website](#).

Generative Artificial Intelligence Tools

The term "GenAI" refers to the following tools *as well as any other similar models that create content using sophisticated learning algorithms*: ChatGPT, Claude, Copilot, Gemini, Llama, DeepSeek, and many translation tools. GenAI also refers to such tools that may be integrated into other services like Notion, Canva, and Grammarly.

The use of generative AI tools, including ChatGPT and other similar tools, to complete or support the completion of any form of assignment or assessment in this course is not allowed and would be considered academic misconduct. Submitting any course material to a generative AI tool is a violation of intellectual property.

The **exception** is use of the AI tutor that is embedded within Achieve. This has been designed to support your learning and therefore leads you to the correct answer rather than simply providing the correct answer.

Achieve Assignment policies

All Achieve assignments (6 in total) which are graded (out of 100 pts) will be weighted equally to produce the final average. The highest 5 grades will be used to calculate the Achieve assignment average. The extra credit Achieve assignments will be used as part of your section specific participation grade. **Grades in Achieve do not instantly sync with the Canvas gradebook but will do so usually within 24 hours. If the grades for your Achieve assignments consistently do not appear in Canvas after this time, please contact your instructor.**

Worksheet Questions and Tutorials

Worksheets are provided for each unit and will be made available through the All lectures Canvas site. These are questions that should be completed after the lectures for the unit is complete. These questions will not be graded and are typical of the questions on the midterms and final. Two questions will be selected from each worksheet and will be taken up in the tutorial. You are encouraged to go to any tutorial time/place to participate in the tutorial activity. Attendance is not mandatory and you are not assigned to a specific classroom or time/day.

Examination policies

Students are expected to write the midterm and final examinations **in person** on the dates and times they are scheduled. Students requiring accommodation or having irreconcilable conflicts for exams should notify their course instructor as soon as possible (no later than 2 weeks before the midterm or 1 month before the final exam). Should you miss the midterm exam due to illness or for other valid reasons, please complete the self-declaration form available on the All Lectures Canvas site and submit to your course instructor within one week of the scheduled exam date. Once approved, and at the discretion of your course instructor, either the grade amount for the missed midterm exam will be transferred to the final exam or you will write a makeup midterm exam. Should you miss the final exam due to illness or for other valid reasons, please contact the faculty advising office in Applied Science. Please refer to UBC's policy on [Academic Concession](#) for details.

If you are ill: Please don't come to class if you have an illness that could be transmitted to your classmates (e.g., a respiratory infection). In this class, the marking scheme is intended to provide flexibility so that you can prioritize your health and still succeed. Please inform your instructor if you are ill; you will not lose participation marks if you miss a small number of classes due to illness. If you are ill for a long period of time, please contact your instructor to discuss, and apply for an academic concession. More information about UBC's framework for preventing communicable disease is [here](#).

Course Material Distribution and Copying policies

All electronic course materials, including quizzes, worksheets, notes, videos, lecture recordings, and other content are for the express use of CHEM 154 students only, and shall not be copied or distributed in any manner without the written permission of the course instructor. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline. Recording of CHEM 154 lectures is not permitted without the permission of the course instructor. Course materials includes, but is not limited to, posting or streaming materials to any Internet site or service not associated with the CHEM 154 course, or emailing materials to persons not enrolled in CHEM 154. Students who violate these policies not only violate the privacy of their classmates and instructors (in the case of lecture recordings) but will be subject to disciplinary measures. Submitting any course material to a generative AI tool is a violation of intellectual property.

Weather Contingency Plan for Class Sessions, Quizzes, and Exams

In-person, on campus activities may need to be cancelled due to issues such as weather conditions (e.g., snow). The most up-to-date information about cancellations will be posted on [ubc.ca](#). Please check [ubc.ca](#) often during times when an extreme weather event could disrupt our course activities. If in-person classes or exams are cancelled, the following contingency plans will take effect. The uncertainty that comes with extreme weather events can be stressful. Rest assured we will be flexible with assignment deadlines and communicate with you as early as we can. we will try to communicate with you about weather-related class cancellations through Canvas announcements. Here is what you can expect in the event an in-person class session, quiz, or exam is cancelled:

In case in-person classes are cancelled due to weather: If in-person activities are cancelled due to weather or other environmental conditions, class will be held online. The Zoom link will be posted on Canvas. For those unable to participate in an online class on short notice, I will provide a lecture recording that is posted to Canvas.

If weather impacts the midterm we will reschedule: Please see Canvas for rescheduling notifications.

If you are registered to write exams at the Centre for Accessibility, I encourage you to reach out to your CFA advisor well in advance to discuss the weather contingency plan for this course.

UBC Policy V-130 requires the following statement be included in each course syllabus:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).