

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

Sarah Burke
Section 111 – LIFE 2201
T/Th 11:00 – 12:20

Office: 261-B Brimacombe Building
Email: saburke@phas.ubc.ca

Office hours

W 10:30-11:30
(Also available by appointment)

Jianxiong (Joe) Yang
Section 133 – ESB 1013
T/Th 15:30 – 16:50

Office: E316 Chemistry Building
Email: joe.yang@ubc.ca

Office hours

W/F 16:00-17:00
(Also available by appointment)

Mark Thachuk
Section 177 – HEBB 100
T/Th 12:30 – 13:50

Office: D328 Chemistry Building
Email: thachuk@chem.ubc.ca

Office hours

T 14:00-15:00/Th 11:00-12:00
(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

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 lab Canvas site, not to Piazza.** Remember that your instructor is ready to answer questions during their posted office hours. Also, the course operates a Resource Centre with teaching assistants able to help you. 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 \$35.55. 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 laboratory Canvas site. 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	Workbook 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	Kinetics	10
13	Electrochemistry	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 OF CHEM 154 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:

In-class activities (worksheets)	5%
Achieve assignments	10%
Quizzes	12.5%
Midterm exam	12.5%
Final exam	45%
Laboratory	15%

Quizzes are tentatively scheduled for release on September 29, October 13, October 27, and November 24, and the midterm exam is scheduled for Tuesday, November 15 from 19:00-20:00 (Vancouver time). Quizzes are 20 minutes long and completed online. A quiz is open for approximately 24 hours and can be completed anytime within the open time period. However, once started, a quiz must be completed in 20 minutes. The midterm and final exams will be written **in person**. Quiz dates are subject to change depending on how quickly we move through the course material. Any changes to the quiz schedule will be posted on the All Lectures Canvas site and announced in class.

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, and completing laboratory activities.

Are there any important dates I should know about?

Assignments

Periodic assignments for each content module will be posted on Achieve. Assignments will generally be posted at 0:00 (Vancouver time) on Tuesdays and be due the following Monday by 23:59 (Vancouver time) (~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 assignment is a high-school review on stoichiometry due on **Wednesday, 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. 19 th - 2022	Labs begin this week
Sept. 14 th - 2022	“Relevance of this course to engineering” Bonus assignment on Canvas due
Sept. 14 th - 2022	First Achieve Assignment (Stoichiometry) due by 23:59
Sept. 19 th - 2022	Last day for withdrawal from most Winter Session Term 1 courses
Oct. 28 th - 2022	Last day for withdrawal with a W standing
Nov. 15 th - 2022	Midterm Exam (19:00-20:00)
Dec. 7 th - 2022	Last day of classes
Dec. 11 th -22 nd - 2022	Final Examination Period

What are the rules of the game?

Academic Honesty

Students are expected to follow the University of British Columbia academic integrity guidelines, which can be found at <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,959>. 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.

Quiz, Worksheet and Achieve Assignment policies

The due dates and submission policies for worksheets are section-specific and set by your course instructor. No make-up marks for worksheets will be provided. **Please note, however, that all students will have their three lowest worksheet grades automatically removed from their overall worksheet grade to account for absences.**

There are no supplemental (makeup) quizzes. **Your lowest quiz score – including a missed quiz - will be automatically dropped when calculating your overall grade.** Should you miss a second quiz 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 quiz date. Once approved, the grade amount for this missed quiz will be transferred to the final exam.

All lecture Achieve assignments are graded out of 100% and weighted equally to produce the final average. For students who complete the “Relevance of this course to engineering” Bonus assignment, the lowest Achieve assignment grade will be removed before calculating the final average. **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.**

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.

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. This 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.

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 and cultural 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: <https://senate.ubc.ca/policies-resources-support-student-success>

COVID

Public health authority and/or UBC guidance and requirements related to the COVID-19 pandemic are dynamic, and change frequently. Please consult <https://www2.gov.bc.ca/gov/content/covid-19/info/response> for the latest information from the government of British Columbia, and <https://www2.gov.bc.ca/gov/content/education-training/post-secondary-education/institution-resources-administration/studying-during-covid-19> and/or <https://covid19.ubc.ca/> for information specific to post-secondary institutions. Before attending class, students and faculty should self-monitor and assess their health using the BC Thrive assessment tool at <https://bc.thrive.health/>. Students should not attend class if this tool or a provincial health representative has directed them to self-isolate, or if they have symptoms of COVID-19.