COURSE OUTLINE		
TERM: Fall 2026	**COURSE NO:** CHEM 154	
INSTRUCTOR:	**COURSE TITLE:** Chemical Principles for Engineers	
OFFICE: **LOCAL:** **E-MAIL:** @capilanou.ca	**SECTION NO(S):**	**CREDITS:** 4.0
OFFICE HOURS:		
COURSE WEBSITE:		

Capilano University is named after Chief Joe Capilano (1854–1910), an important leader of the Sḵwx̱wú7mesh (Squamish) Nation of the Coast Salish Peoples. We respectfully acknowledge that our campuses are located on the unceded territories of the səlilwətaɬ (Tsleil-Waututh), shíshálh (Sechelt), Sḵwx̱wú7mesh (Squamish), and xʷməθkʷəy̓əm (Musqueam) Nations.

COURSE FORMAT

Three hours of class time, three lab hours plus an additional hour of supplemental activity delivered through on-line or other activities for a 15-week semester, which includes two weeks for final exams.

COURSE PREREQUISITES/COREQUISITES

Chemistry 12 (B) or CHEM 101 (B) or BCHM 054 (B); and MATH 116 is a pre or co-requisite

CALENDAR DESCRIPTION

A course for engineering students only. A study of stoichiometry, atomic structure and bonding, the solid state, chemical kinetics, chemical equilibrium, thermodynamics and electrochemistry.

COURSE NOTES

CHEM 154 is an approved Quantitative/Analytical course for baccalaureate degrees.
CHEM 154 is an approved Science course.
CHEM 154 is an approved Laboratory Science course.
CHEM 154 is an approved Numeracy course for Cap Core requirements.

REQUIRED TEXTS AND/OR RESOURCES

Textbook: Overby, J. *Chemistry*. 15th ed. Toronto: McGraw-Hill, 2024.
Capilano University *Chemistry 154 Laboratory Manual and Student Laboratory Guide*.

Supplement: Graphing calculator (TI-83 or equivalent).

COURSE STUDENT LEARNING OUTCOMES

On successful completion of this course, students will be able to do the following:

- Demonstrate proper application of the relationships between molar mass, chemical formulae, the mole concept, chemical equations, solutions, gases to solving stoichiometric problems.
- Demonstrate a knowledge of atomic structure, chemical bonding and the properties of matter.
- Develop an understanding of the chemistry of solids and explore the chemical processes which occur at surfaces.
- Solve kinetic problems and relate experimental data to reaction mechanisms.
- Describe and apply the concepts aqueous equilibria to problem solving.
- Apply the principles of thermodynamics to problem solving.
- Follow lab procedures and perform chemical experiments safely and independently.
- Take appropriate measurements to generate data required to solve experimental problems.
- Analyze experimental data and communicate in a written report

Students who complete this Numeracy course will be able to do the following:

- Apply both analytical and numerical skills to solve problems.
- Summarize and analyse data in quantitative forms.
- Interpret and draw conclusions from an analysis of quantitative data.
- Represent quantitative information in a variety of forms (eg. Symbolically, visually, numerically, and verbally).
- Incorporate quantitative evidence in support of an argument.

COURSE CONTENT

Topic	Chapter(s) in Text	Weeks (approx)
Stoichiometry Review of the chemical language; basic atomic structure; mass relationship between atoms and molecules; general properties of solutions; chemical equations; different types of reactions; limiting reactants; general properties of gases	1 - 5	1-2
Atomic Structure Energy, matter and electromagnetic radiation; quantum theory and spectroscopy; the Bohr atom; wave mechanics; quantum numbers; electron configuration; periodic trends	7 & 8	3-5
The Solid State Intermolecular forces; general properties of solids; crystal structures; metallic crystals; ionic crystals; covalent crystals; molecular crystals; amorphous solids	11	6

Topic	Chapter(s) in Text	Weeks (approx)
Chemical Kinetics Rates of reaction; rate laws and the order of a reaction; integrated rate laws and half-lives; reaction energetics; reaction mechanisms	13	7-9
Chemical Equilibrium The equilibrium condition and its relationship to kinetics; Le Chatelier's principle and factors that affect chemical equilibrium; applications of the equilibrium expression	14	10
Thermodynamics Defining heat, work and energy; enthalpy; calorimetry; standard enthalpy of formation; Hess's law; spontaneous processes and entropy; second and third laws of thermodynamics; effect of temperature on spontaneity; free energy and its relationship to equilibrium	6 & 17	11-13
Final Exam Period		14-15

EVALUATION PROFILE

Final grades for the course will be computed based on the following schedule:

Term Work	35%
Laboratory Work	20%
Performance Evaluation	10%
Final Examination	35%
TOTAL	**100%**

Term work may consist of tests, quizzes and/or assignments. No single component of term work will be worth more than 25%. Laboratory work will consist of quizzes, laboratory reports and other assessments. The weight and format of individual tests, quizzes, and assignments, etc. are assigned by the instructor and will be announced in class in advance.

A pass grade of 50% or above is required on each of the laboratory and term work portions of the course for the student to pass the course.

Specific dates and details regarding the Evaluation Component will be provided by the instructor.

Performance Evaluation

In the absence of exceptional circumstances, which are evaluated at the instructor's discretion, the performance evaluation component of the final grade will be pro-rated to the rest of the grade. For example, a 10% performance evaluation component would be determined by dividing the remaining mark out of 90 by 9. The most common circumstance justifying an increased performance evaluation mark is a student's improved performance in the final examination relative to the term work, which the instructor feels justifies an elevated letter grade.

GRADING PROFILE

A+ = 90-100	B+ = 77-79	C+ = 67-69	D = 50-59
A = 85-89	B = 73-76	C = 63-66	F = 0-49
A- = 80-84	B- = 70-72	C- = 60-62	

Students should refer to the University Calendar for the effect of the above grades on grade point average.

Incomplete Grades
Grades of Incomplete "I" are assigned only in exceptional circumstances when a student requests extra time to complete their coursework. Such agreements are made only at the request of the student, who is responsible to determine from the instructor the outstanding requirements of the course.

Late Assignments
Assignments are due at the beginning of the class on the due date listed. If you anticipate handing in an assignment late, please consult with your instructor beforehand.

Missed Exams/Quizzes/Labs etc.
Students must inform their instructor on the day of the exam or beforehand, if they are unable to attend. Make-up exams, tests and/or labs or extensions on assignment due dates are given at the discretion of the instructor. They are generally given only in medical emergencies or severe personal crises, and to students who have been fully participating in the course until that time. Some missed labs or other activities may not be able to be accommodated. Please consult with your instructor. ***Accommodations can be made to honour community needs and traditional practices.

Attendance
Students are expected to attend all classes and associated activities. If classes are missed, it is the student's responsibility to become aware of all information given out in the classes or tutorials, including times of examinations and assignment deadlines.

English Usage
Students are expected to use correct standard English in their written and oral assignments, exams, presentations, and discussions. Failure to do so may result in reduced grades in any part of the Evaluation Profile. Please refer to the guidelines provided in the Capilano Guide to Writing Assignments (available from the University Bookstore).

Electronic Devices
Students may use electronic devices during class; however, an instructor may ask for devices to be put away if they become a distraction to other students or interfere with classroom learning.

Online Communication
Outside of the classroom, instructors will (if necessary) communicate with students using either their official Capilano University email or eLearn; please check both regularly. Official communication between Capilano University and students is delivered to students' Capilano University email addresses only.

Students are reminded to engage in respectful behavior when participating in discussions.

UNIVERSITY OPERATIONAL DETAILS:

Tools for Success
Many services are available to support student success for Capilano University students. A central navigation point for all services can be found at: https://www.capilanou.ca/student-services/

Capilano University Security: download the CapU Safe Alert App

Policy Statement (S2009-06)
Capilano University has policies on Academic Appeals (including appeal of final grade), Student Conduct, Academic Integrity, Academic Probation and other educational issues. These and other policies are available on the University website.

Academic Integrity (S2017-05)
Any instance of academic dishonesty or breach of the standards of academic integrity is serious and students will be held accountable for their actions, whether acting alone or in a group. See policy and procedures S2017-05 Academic Integrity for more information:
https://www.capilanou.ca/about-capu/governance/policies/

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited and will be handled in accordance with the Student Academic Integrity Procedures.

Academic dishonesty is any act that breaches one or more of the principles of academic integrity. Acts of academic dishonesty may include but are not limited to the following types:

Cheating: Using or providing unauthorized aids, assistance or materials while preparing or completing assessments, or when completing practical work (in clinical, practicum, or lab settings), including but not limited to the following:

- Copying or attempting to copy the work of another during an assessment;
- Communicating work to another student during an examination;
- Using unauthorized aids, notes, or electronic devices or means during an examination;
- Unauthorized possession of an assessment or answer key; and/or,
- Submitting of a substantially similar assessment by two or more students, except in the case where such submission is specifically authorized by the instructor.

Fraud: Creation or use of falsified documents.

Misuse or misrepresentation of sources: Presenting source material in such a way as to distort its original purpose or implication(s); misattributing words, ideas, etc. to someone other than the original source; misrepresenting or manipulating research findings or data; and/or suppressing aspects of findings or data in order to present conclusions in a light other than the research, taken as a whole, would support.

Plagiarism: Presenting or submitting, as one's own work, the research, words, ideas, artistic imagery, arguments, calculations, illustrations, or diagrams of another person or persons without explicit or accurate citation or credit.

Self-Plagiarism: Submitting one's own work for credit in more than one course without the permission of the instructors, or re-submitting work, in whole or in part, for which credit has already been granted without permission of the instructors.

Prohibited Conduct: The following are examples of other conduct specifically prohibited:

- Taking unauthorized possession of the work of another student (for example, intercepting and removing such work from a photocopier or printer, or collecting the graded work of another student from a stack of papers);
- Falsifying one's own and/or other students' attendance in a course;
- Impersonating or allowing the impersonation of an individual;
- Modifying a graded assessment then submitting it for re-grading; or,
- Assisting or attempting to assist another person to commit any breach of academic integrity.

Sexual Violence and Misconduct

All Members of the University Community have the right to work, teach and study in an environment that is free from all forms of sexual violence and misconduct. Policy B401 defines sexual assault as follows:

> Sexual assault is any form of sexual contact that occurs without ongoing and freely given consent, including the threat of sexual contact without consent. Sexual assault can be committed by a stranger, someone known to the survivor or an intimate partner.

Safety and security at the University are a priority and any form of sexual violence and misconduct will not be tolerated or condoned. The University expects all Students and Members of the University Community to abide by all laws and University policies, including B.401 Sexual Violence Policy and B.401.1 Sexual Violence Procedure (found on Policy page https://www.capilanou.ca/about-capu/governance/policies/)

Emergencies: Students are expected to familiarise themselves with the emergency policies where appropriate and the emergency procedures posted on the wall of the classroom.

DEPARTMENT OR PROGRAM OPERATIONAL DETAILS

Professionalism

Students are expected to demonstrate a professional attitude and behaviour: reliability, respect for and cooperation with colleagues, willingness to work calmly and courteously, respect for equipment and systems, and constructive response to criticism.

Final Exam Period

Students should note the final exam period and that they can expect to write exams at any time during this period. Individual exam times will not normally be rescheduled because of holidays, work, or other commitments. While efforts are made to spread exams throughout the exam period, an individual's particular course combination may result in exams being scheduled close together or spread widely through the entire exam period.