UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2003
REVISED COURSE IMPLEMENTATION DATE: September 2026
COURSE TO BE REVIEWED (six years after UEC approval)**:** January 2032
Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: CHEM 110	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Introductory Chemistry **Course Short Title:** Introductory Chemistry	
Faculty: Faculty of Science	**Department/School:** Chemistry

Calendar Description:

Principles of chemical kinetics and thermodynamics, redox processes, gas laws, and chemistry of solutions, including solubility and acid-base equilibria.

Prerequisites (or NONE):	(One of Chemistry 11, Chemistry 12, or CHEM 083) and (one of Foundations of Mathematics 11, Pre-calculus 11, Principles of Mathematics 11, Foundations of Mathematics 12, Pre-calculus 12, Principles of Mathematics 12, or any UFV MATH course numbered 085 or higher).
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	45
Supervised laboratory hours (science lab)	45
Total hours	**90**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **Yes**

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **Face-to-face only**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **Yes**

Submit outline for (re)articulation: **No**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	October 10, 2025
Faculty Council approval	**Date of meeting:**	October 31, 2025
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	January 30, 2026

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. Describe the properties of solutions.
2. Apply the concepts of chemical equilibrium to problems involving solutions and gases.
3. Describe the properties of acids and bases.
4. Discuss the difference between strong and weak acids and bases.
5. Explain the purpose of the pH scale and use it to classify weak acids and bases.
6. Use concepts of chemical kinetics to describe the rate law of a reaction.
7. Analyze the differences between first-order and second-order chemical reactions in terms of their rate laws and kinetic behavior.
8. Explain the effect of temperature on the rate of a chemical reaction.
9. Explain how energy, enthalpy, and entropy are related.
10. Apply Hess's Law to solve thermochemical problems.
11. Explain the relationships between the simple and the ideal gas laws.
12. Describe oxidation and reduction processes.
13. Perform basic laboratory operations.
14. Demonstrate the practice of laboratory safety.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	40%	Quizzes/tests/midterm:	30%	Assignments:	10%
Lab work:	20%		%		%

Details:

Lab grade distribution:

- Pre-lab assignments: 10%
- Report sheets: 45%
- Video technique quizzes: 5%
- Tutorial quizzes: 10%
- Lab exam: 30%

Students must receive at least 50% in the lab and at least 40% on both lecture and lab final exams in order to receive a passing grade.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures, labs, group problem-solving sessions.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Tro, N.	Principles of Chemistry	Current
2.	Other		UFV Lab Manual for CHEM 110	
3.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Lab coat and safety glasses are required.

Course Content and Topics

Solutions (Tro, chapter 4)
Concentration. Dilution. Electrolytes and Nonelectrolytes.
Arrhenius theory of electrolytic dissociation. Ionic equations. Solution stoichiometry.

Gases (Tro, chapter 5)
Units of pressure. Ideal gas equation. Dalton's Law of partial pressures. Basic principles of Kinetic Molecular Theory of Gases.

Chemical equilibria (Tro, chapter 14)
Reversible reactions. Chemical equilibrium. Equilibrium constant. Reaction quotient. Calculation of equilibrium concentrations.
Factors that affect chemical equilibrium. Le Châtelier's Principle.

Solubility (Tro, chapter 16)
Molecular view of solution process. Enthalpy and entropy of dissolution. Solubility equilibrium. Solubility.
Effect of temperature on solubility of solids and gases. Effect of pressure on solubility of gases.
Solubility product. Solubility calculations. Common ion effect.

Acids and Bases (Tro, chapter 15)
Brønsted-Lowry theory. Conjugate acid-base pairs. Acid-base properties of water. The ion product of water. pH, pOH, and pK_w. Strong and weak acids and bases. Ionization constants K_a and K_b. Relationship between K_a and K_b. Acid-base titration. Acid-base properties of salts. Hydrolysis (qualitatively). Buffers.

Chemical kinetics (Tro, chapter 13)
Rate of reaction. Rate laws. Rate constant. First- and second-order reactions. Principles of collision theory. Temperature dependence of the rate constant. Activation energy. Arrhenius equation. Multistep processes. Energy profiles for multistep processes. Intermediates. Rate-limiting step. Catalysis. Energy profiles for catalyzed and uncatalyzed reactions.

Thermodynamics (Tro, chapter 6)
Energy changes in chemical reactions. Exothermic and endothermic reactions.
Hess' Law. Thermochemical calculations.
Energy and enthalpy. Enthalpy changes in chemical reaction. Standard enthalpy of formation and reaction.
Concept of Entropy.

Redox reactions (Tro, chapters 4 and 18)
Oxidation number. Oxidation. Reduction. Half-reactions. Balancing redox reactions (half-reaction method; acidic and basic solutions).
Galvanic cells. Standard reduction potential. Spontaneity of redox processes.
Batteries.

Laboratory experiments will illustrate theoretical material and may include the following experiments:

1. Preparation of solutions
2. Spectrophotometric study of an unknown copper compound
3. Thermochemistry: heats of reaction
4. Chemical equilibrium: equilibrium investigations and Le Châtelier's principle
5. Equilibrium: the determination of Ksp values
6. Acids, bases, and buffered systems
7. Potentiometric titrations
8. Oxidation-reduction titration
9. Investigation of gas laws
10. Factors affecting reaction rate