UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2003
REVISED COURSE IMPLEMENTATION DATE: January 2016
COURSE TO BE REVIEWED: (six years after UEC approval) October 2021
Course outline form version: 09/15/14

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 (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Chemistry

Calendar Description:

This course covers the principles of chemical kinetics and thermodynamics, redox processes, gas laws, and chemistry of solutions, including solubility and acid-base equilibria. It can be used as a prerequisite for CHEM 113 by students without Chemistry 12.

Prerequisites (or NONE):	One of the following: (Chemistry 11, Chemistry 12, or CHEM 083) and one of the following: (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

Equivalent Courses (cannot be taken for additional credit)
Former course code/number:
Cross-listed with:
Equivalent course(s):
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☒ Yes ☐ No
Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☒ No (if yes, fill in transfer credit form)
Resubmit revised outline for articulation: ☐ Yes ☒ No
To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 90
Typical structure of instructional hours:

Lecture hours	45
Seminars/tutorials/workshops	
Laboratory hours	45
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	90

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No
If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit
Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): every semester

Department / Program Head or Director: David Fenske	**Date approved:**	April 17, 2015
Faculty Council approval	**Date approved:**	May 1, 2015
Campus-Wide Consultation (CWC)	**Date of posting:**	May 22, 2015
Dean/Associate VP: Lucy Lee	**Date approved:**	April 17, 2015
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	October 2, 2015

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. Discuss critically the difference between a first-order and second-order rate chemical reaction.
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.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lectures, labs, group problem-solving sessions.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☒ No ☐

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

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Tro, N.	Principles of Chemistry	☒	Pearson	2013
2.		UFV Lab Manual for CHEM 110	☐		
3.			☐		
4.			☐		
5.			☐		

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

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	10%	Midterm exam:	30%	Practicum:	%
Quizzes/tests:	%	Lab work:	20%	Field experience:	%	Shop work:	%
Other:	%	Other:	%	Other:	%	Total:	100%

Details (if necessary):

Typical 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