UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2002
REVISED COURSE IMPLEMENTATION DATE: September 2016
COURSE TO BE REVIEWED: (six years after UEC approval) December 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 113	**Number of Credits:** 5 Course credit policy (105)
Course Full Title: Principles of Chemistry I **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Chemistry

Calendar Description:

An introduction to chemistry with emphasis on theory of atomic and molecular structure and bonding. Work performed in the laboratory complements lecture material. Completion of CHEM 113 and 114 will satisfy the requirements for honours, majors, or minors programs in science.

Prerequisites (or NONE):	(Chemistry 12 or CHEM 110) and (one of the following: Principles of Mathematics 12, Pre-calculus 12, MATH 095, MATH 096, or MATH 110).
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: CHEM 111

Cross-listed with:

Equivalent course(s): CHEM 111

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: 102

Typical structure of instructional hours:

Lecture hours	45
Seminars/tutorials/workshops	12
Laboratory hours	45
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**102**

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.): annually

Department / Program Head or Director: David Fenske	**Date approved:**	September 2015
Faculty Council approval	**Date approved:**	September 2015
Campus-Wide Consultation (CWC)	**Date of posting:**	November 20, 2015
Dean/Associate VP: Lucy Lee	**Date approved:**	September 2015
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	December 18, 2015

Learning Outcomes

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

1. Explain the nature of light, using the concepts of frequency, wavelength, energy, and wave-particle duality.
2. Describe the Bohr model of the hydrogen atom, and explain its inadequacies compared to the quantum model of the hydrogen atom.
3. Explain the concept of atomic orbitals and describe the shapes of the s, p, and d orbitals.
4. Explain how the periodic table is determined by the electronic configuration of the elements.
5. Explain several periodic properties of elements using the concepts of shielding and penetration.
6. Generate Lewis dot diagrams of molecules.
7. Predict the three-dimensional shapes of simple molecules.
8. Describe the bonding in a simple molecule using qualitative valence bond theory.
9. Describe the bonding in diatomic gases using molecular orbital theory.
10. Describe and name simple organic molecules containing common functional groups (alkanes, alkenes, alkynes, alcohols, alkyl halides, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides).
11. Draw diagrams of the conformations of alkane derivatives.
12. Identify and name different stereoisomers of organic molecules.
13. Safely and efficiently perform basic chemical procedures in the laboratory.
14. Accurately record experimental data and observations in the laboratory.
15. Work efficiently and respectfully as a team with other students to complete selected laboratory experiments.
16. Communicate experimental results and analyses clearly through written laboratory reports.
17. Demonstrate laboratory knowledge and skills including the use of quantitative glassware and analytical balances with acceptable precision, and the application of basic spectrophotometric techniques.
18. Exhibit rudimentary skills with Gaussian Molecular Modelling software.

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.	Petrucci R.H., et al.	General Chemistry: Principle and Modern Applications	☒	Pearson	2010
2.	Fritzke, G., Webb, J.	Chemistry 114 Lab Manual	☒	UFV	Current
3.		Molecular Model Kit (available in the UFV Bookstore)	☐		

Typical Evaluation Methods and Weighting

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

Typical Course Content and Topics

1. Atomic structure and atomic spectra. Introduction to quantum theory.
2. Electronic structure of many-electron atoms, Periodic trends in atomic properties.
3. Chemical bonding. Ionic and covalent bonds. Lewis diagrams.
4. Molecular structure. VSEPR model. Valence bond and molecular orbital theories.
5. Intermolecular interactions. Interactions involving ions, dipoles and induced dipoles, and their relation to physical properties of matter.
6. Introduction to organic chemistry. Nomenclature, functional groups, structure and bonding, stereochemistry, and conformational analysis.

Typical laboratory experiments include:

- Qualitative Analysis of Anions
- Gravimetric Analysis of Ni
- Redox Titration
- Back Titration
- Spectrophotometry of Cr(III) Ions
- Molecular Geometries
- Periodic Properties
- Introduction to Chromatography
- Naming and Structure of Organic Molecules