UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: 1993
REVISED COURSE IMPLEMENTATION DATE: September 2018
COURSE TO BE REVIEWED (six years after UEC approval)**:** June 2022
Course outline form version: 10/27/2017

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

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

Course Code and Number: CHEM 083	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Advanced-Level Chemistry **Course Short Title:**	
Faculty: Faculty of Access and Continuing Education	**Department:** Upgrading and University Preparation

Calendar Description:

Introduction to chemistry for students who wish to prepare for entry into first-year courses in sciences, health sciences, or technology. Atomic structure, stoichiometry, and chemical properties of the elements are emphasized. Laboratory work is closely related to material covered in lectures.

Prerequisites (or NONE):	Science 10. Note: One of Principles of Mathematics 11, Applications of Mathematics 11, Foundations of Mathematics 11, Pre-calculus 11, or MATH 085 is highly recommended.
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: N/A
Cross-listed with: N/A
Dual-listed with: N/A
Equivalent course(s): N/A

Typical Structure of Instructional Hours

Lecture/seminar hours	
Tutorials/workshops	66
Supervised laboratory hours	24
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**90**

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Special Topics
This course is offered with different topics:
☒ No ☐ Yes
If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☒ No ☐ Yes
Submit revised outline for rearticulation:
☒ No ☐ Yes

Grading System
☒ Letter Grades ☐ Credit/No Credit

Expected Frequency of Course Offerings:
Every semester

Department / Program Head or Director: Greg St. Hilaire	**Date approved:**	January 10, 2018
Faculty Council approval	**Date approved:**	January 31, 2018
Dean/Associate VP: Sue Brigden	**Date approved:**	January 31, 2018
Campus-Wide Consultation (CWC)	**Date of posting:**	February 16, 2018
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	February 23, 2018

Learning Outcomes:

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

A. Measurement
- Demonstrate the concepts of precision and accuracy and how they differ, utilizing significant figures
- Perform calculations using scientific notation
- Perform conversions with the SI system

B. Properties of Substances
- Differentiate between the phases of matter
- Identify chemical or physical properties of substances
- Describe Dalton's Atomic Theory and the Law of Constant Composition

C. Periodic Trends
- Use the periodic table to determine atomic composition of isotopes
- Use the periodic table to predict electron arrangement of chemical families in order to predict trends in ion charge, reactivity, ionization energy, electronegativity, atomic radii, and ionic radii

D. Atomic Structure
- Analyze the historical development of atomic theory
- Describe the Bohr and Wave Mechanical model of the atom and cite evidence for these models including absorption and emission spectra and their use in modern technology

E. Mole Concept
- Define a mole and its significance
- Perform calculations including molar and formula mass, mole to mass conversions, and percent composition by mass of compounds

F. Bonding
- Define covalent and ionic bonding
- Construct the formulas of compounds
- Use electronegativity to predict bond types
- Draw Lewis structures, predict molecular shapes, and determine polarity

G. Nomenclature
- Write names for compounds given the formulae and write formulae for compounds given the names for the following types of compounds:
  - Covalent compounds
  - Ionic compounds
  - Compounds containing polyatomic ions
  - Compounds containing transition metals
  - Acids

H. Chemical Reactions
- Balance equations
- Classify and predict single and double replacement reactions, combustion reactions, and acid- base neutralizations
- Classify synthesis, decomposition, exothermic and endothermic reactions
- Perform stoichiometric calculations including mass-to-mass, limiting reagent, and percent yield

I. Solutions
- Predict solubility and conductivity of polar and non-polar compounds
- Define Arrhenius acids and bases
- Relate the pH scale to acids and bases
- Perform calculations involving dilutions
- Perform stoichiometric calculations involving solutions including titrations

J. Organic Chemistry
- Classify substances as organic
- Differentiate the various types of bonding between carbon atoms
- Write names and draw structures of hydrocarbons
- Categorize organic compounds based on their functional groups

Options may include additional organic chemistry, nuclear chemistry, gas laws, and environmental ethics.

Laboratories

Chemistry laboratories are an essential component of the study of chemistry. During laboratories, students reinforce theory through practice. Laboratories develop skills in safety, procedures, techniques, data collection, analysis, and communication.

In the laboratory exercises, students will:
- List the safety and protective equipment available in a laboratory setting
- Demonstrate the appropriate procedures and techniques for dealing with particular hazards and hazardous materials
- Follow instructions and procedures
- Handle appropriate equipment for measuring mass, volume, and temperature
- Prepare solutions
- Perform titrations
- Collect and record data effectively
- Analyze and interpret data

- Communicate results and conclusions

A minimum of eight labs are to be completed covering the core concepts

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.)*

Presentation of the course will be by interrelated theory classes, discussion periods, and laboratory sessions.

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

Typical Text(s) and Resource Materials

	Author	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	TRO	Introductory Chemistry Essentials Plus Mastering Chemistry Access Card Ed	5	Pearson	2014
2.		CHEM 083 Course Materials	☐	UFV CP	2016

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

Lab coat

Typical Evaluation Methods and Weighting

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

Typical Course Content and Topics

Unit 1: Introduction to Chemistry
Course outline, brief historical perspective of chemistry. The scientific method. Scientific mathematics - a review of basic math. Measurement of mass, volume, density and temperature. Units and significant figures. SI system and exponential notation. Conversion factor method.

Unit 2: Properties of Matter
Classification of matter. Physical and chemical changes. Homogeneous and heterogeneous mixtures. Conservation of energy.

Unit 3: Atoms and Molecules
Names and symbols of elements. Compounds, their composition, names, and formulae. Metals and non-metals. Chemical equations.

Unit 4: Stoichiometry and the Mole
The mole. Percentage composition, empirical and molecular formulae. Mole-mole, mole-mass and mass-mass calculations using stoichiometric equations. Calculations involving a limiting reagent. Molarity calculations.

Unit 5: Atomic Structure
The atom and fundamental particles. Isotopes and atomic mass. Energy levels, quantum numbers and electron configurations.

Unit 6: Chemical Families
Classification of elements in the Periodic Table and the relationship between position in the table, electron configuration, and physical and chemical properties.

Unit 7: Compounds and Bonding
Lewis electron-dot representations of atoms and molecules. Ions, oxidation numbers and simple oxidation/reduction reactions.

Unit 8: Organic Chemistry
Bonding in organic molecules. Alkanes, alkenes and alkynes. Naming and isomerism. Simple organic reactions. Polymers.

Laboratory Experiments (8 or 9 labs will typically be chosen). Examples include:

1. Measurements
2. Separating Mixtures
3. Water of Hydration
4. Recycling Copper
5. The Reaction Between Iron and Copper Sulphate
6. The Copper-Silver Nitrate Reaction
7. Acid-base Titrations: The Percentage of Acetic Acid in Vinegar
8. Periodic Trends in Properties
9. Organic Chemistry
10. Determination of the Molar Mass of an Unknown Acid
11. Determination of the Percentage Oxygen in Potassium Chlorate
12. Conservation of Mass