ORIGINAL COURSE IMPLEMENTATION DATE: 1993
REVISED COURSE IMPLEMENTATION DATE: January 2022
COURSE TO BE REVIEWED (six years after UEC approval)**:** June 2022
Course outline form version: 05/18/2018

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: Adult Basic Education Advanced-Level Chemistry
Course Short Title: ABE Advanced Chemistry
(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

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: Some mathematics preparation at the Grade 11 level 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:
Cross-listed with:
Dual-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 hours	66
Tutorials/workshops	
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 *(Double-click on boxes to select.)*
This course is offered with different topics:
☒ No ☐ Yes *(If yes, topic will be recorded when offered.)*

Independent Study
If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*
☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☒ No ☐ Yes
Submit outline for (re)articulation:
☒ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System
☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only):

Expected Frequency of Course Offerings:
Every semester *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Greg St. Hilaire	**Date approved:**	April 9, 2021
Faculty Council approval	**Date approved:**	April 9, 2021
Dean/Associate VP: Sue Brigden	**Date approved:**	April 9, 2021
Campus-Wide Consultation (CWC)	**Date of posting:**	n/a
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	June 18, 2021

Learning Outcomes:

After completion of Chem 083 students will meet the outcomes described for Chemistry Advanced Level in the 2020-2021 ABE Articulation guide available at https://www.bctransferguide.ca/docs/ABE2020.pdf

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 early atomic theory and related laws

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 *(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	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, scientific calculator.

Typical Evaluation Methods and Weighting

Final exam:	30%	Assignments:	10%	Field experience:	%	Portfolio:	%
Midterm exam:	%	Project:	%	Practicum:	%	Other:	%
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