ORIGINAL COURSE IMPLEMENTATION DATE:	1993
REVISED COURSE IMPLEMENTATION DATE:	January 2023
COURSE TO BE REVIEWED (six years after UEC approval)**:**	June 2028

Course outline form version: 09/08/2021

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

Faculty: Faculty of Education, Community, and Human Development

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: **N/A**

Cross-listed with: **N/A**

Equivalent course(s): **N/A**

(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	66
Supervised labroratory hours (science lab)	24
Total hours	**90**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ 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: **May be offered in multiple delivery modes**

Expected frequency: **Every semester**

Maximum enrolment (for information only)**: 24**

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:**	April 9, 2021
Faculty Council approval	**Date of meeting:**	December 3, 2021
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	June 17, 2022

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:

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 andemission 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 ofcompounds

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 typesof 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

Laboratories

Chemistry laboratories are an essential component of the study of chemistry. During laboratories, students reinforce theory throughpractice. 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.

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/search/abe.

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

Final exam:	25%	Assignments:	10%	Quizzes/tests:	20%
Lab work:	20%	Midterm exam	25%		%

Details:

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

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	Nivaldo J. Tro	Introductory Chemistry Essentials Plus Mastering Chemistry Access Card 5th Ed, Pearson	2014
2.	Other		CHEM 083 Course Materials	2016

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

Lab coat, scientific calculator.

Course Content and Topics

Unit 1: Introduction to Chemistry Brief historical perspective of chemistry. The scientific method. Scientific mathematic- 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, Law of conservation of mass and Law of conservation of energy.

Unit 3: Atoms and Molecules Early Atomic theory and related laws, Names and symbols of elements, Metals and non-metals, Compounds, their composition, classification, names and formulae, Writing and balancing chemical equations, Classifying chemical reactions, Predicting products of single and double replacement reactions. Acids and Bases, Neutralization reactions

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 and percent yield. Solutions, Molarity and dilution calculations, Titrations

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 their position in the table and electron configuration, Trends in atomic radii, ionic radii, ionization energy, electron affinity, metallic character and reactivity.

Unit 7: Compounds and Bonding Ionic and Covalent bonds, Lewis electron-dot representations of atoms, molecules and ions, Electronegativity and polar bonds, Molecular shapes

Unit 8: Organic Chemistry Bonding in organic molecules. Alkanes, alkenes and alkynes-naming and isomerism. Classification based on functional groups
Options may include additional organic chemistry, nuclear chemistry, gas laws, and environmental ethics.

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