

## DEPARTMENT OF SCIENCE COURSE OUTLINE – FALL 2022

### CH1030 A2: Introductory University Chemistry I – 4.3(3-1-1.5) 82.5 Hours over 15 weeks

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

**INSTRUCTOR:** Les Rawluk  
**OFFICE:** J214

**PHONE:** 780 539 2738  
**E-MAIL:** lrawluk@gprc.ab.ca

**OFFICE HOURS:** Unrestricted; drop-in, appointment, email, or Zoom as needed

**CALENDAR DESCRIPTION:** Basic chemical concepts, atomic and molecules structure, chemical bonding, behaviours of liquids, solids, and gases. **Restricted to Engineering students.**

**PREREQUISITE(S)/COREQUISITE:** Chemistry 30 or equivalent

**REQUIRED TEXT/RESOURCE MATERIALS:** Recommended textbook is Chemistry 2<sup>nd</sup> Edition by OpenStax. This is an Open Educational Resource available at no charge; the required Lab manual is Introductory University Chemistry I (Chem 101 and 103), published by the University of Alberta.

**DELIVERY MODE(S):** Lecture style presentation of material followed by practice problems/discussion in seminar. Laboratory provides hands-on experience.

**COURSE OBJECTIVES:** This course enables students to strengthen their understanding of chemistry through the study of the structure, bonding, and reactivity of chemical substances. Students will further develop their problem-solving and critical thinking skills as they investigate chemical processes, and will refine their ability to communicate scientific information. Emphasis will be placed on understanding of basic principles and the ability to apply these principles to solve problems.

**LEARNING OUTCOMES:** Students will use their introduction to quantum mechanics to describe the Hydrogen atom. They will extend this knowledge to a multi-electron atom, followed by predicting trends in atomic properties as related to atomic position on the periodic table. Students will identify valence electrons, and examine their role in ionic, covalent, and polar covalent bonding. Valence electron role in the 3-D shape of molecules will be explored, and students will be able to predict molecular properties such as melting and boiling point trends, polarity, and viscosity. Students will interpret intermolecular forces for a variety of molecules, and link these forces to the solid, liquid, and vapor states. Students will observe and describe trends in main group element chemistry throughout the course.

**TRANSFERABILITY:** CH1030 transfers to **UA, UC, UL, AU, AF, CU, CUC, KUC.**

Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page <http://www.transferalberta.ca>.

**\*\* Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions.**

**Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

<b>EVALUATIONS:</b>	Quizzes	5%
	Lab Reports	10%
	Lab Exam	10%
	Midterm	25%
	Final Exam	50%

## GRADING CRITERIA:

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	94-100		C+	2.3	68-71
A	4.0	89-93		C	2.0	64-67
A-	3.7	84-88		C-	1.7	60-63
B+	3.3	80-83		D+	1.3	55-59
B	3.0	76-79		D	1.0	50-54
B-	2.7	72-75		F	0.0	00-49

## COURSE SCHEDULE/TENTATIVE TIMELINE:

Matter and Stoichiometry (Chapters 1, 2, 3, 4; Pages 9 – 229) *3 – 4 lectures*

- Units, dimensional analysis
- Periodic table
- Naming simple compounds
- The mole
- Empirical and molecular formula of a compound
- Calculations involving a limiting reagent
- Aqueous solutions and molarity
- Precipitation, acid/base, redox reactions

Atomic Structure (Chapters 2 and 6; Pages 79 – 87 and Pages 281 – 341) *6 – 8 lectures*

- Introduction to Atomic Structure
- Electromagnetic radiation
- Atomic spectra and the Bohr model
- Quantum mechanics and the atom
- Orbital shapes and energies
- Many-electron atoms
- Building of the periodic table
- Trends in atomic properties

Chemical Bonding (Chapters 7 and 8; Pages 343 – 455) *6 – 8 lectures*

- Types of chemical bonds and electronegativity
- Ionic bonding
- Lattice energy
- Covalent bonding

Bond energies and chemical reactions  
Lewis structures; octet rule; resonance, formal charge, exceptions  
VSEPR theory and molecular shape  
Hybridization  
Molecular orbital theory

States of Matter (Chapters 9 and 10; Pages 457 – 519 and Pages 521 – 598) *4 – 6 lectures*

Intermolecular forces  
Gases  
Liquids, solutions  
Solids  
Changes of state, phase diagrams

Chemistry of the Main Group Elements (Chapter 18; Pages 941 – 1027) *1 – 2 lectures*

Periodicity  
Properties of Representative Metals  
Properties of the Metalloids  
Properties of the Nonmetals

**STUDENT RESPONSIBILITIES:**

A student must pass the laboratory portion to receive a passing grade in this course. A “repeat” final exam is not available in this course.

Assignments will be electronically distributed on a roughly weekly basis. Complete solutions will be available a short while later. Solutions to quizzes will be posted a few days after the quiz is completed.

Attendance to all lectures and seminars is strongly recommended. Laboratory attendance to each specific experiment is compulsory. A doctor’s medical note is required for all excused absences.

Students must maintain an overall average of 50% or better to pass this course. You are encouraged to participate in class discussions and ask questions. Help is available outside class time on an “as needed” basis.

**STATEMENT ON PLAGIARISM AND CHEATING:**

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the Northwestern Polytechnic Calendar at <https://www.nwpolytech.ca/programs/calendar/> or the Student Rights and Responsibilities policy which can be found at <https://www.nwpolytech.ca/about/administration/policies/index.html>

**\*\*Note:** all Academic and Administrative policies are available on the same page.