NORTHWESTERN POLYTECHNIC

DEPARTMENT OF SCIENCE

COURSE OUTLINE – FALL 2023

CH1030 A2: Introductory University Chemistry I – 4.3(3-1-1.5)

82.5 Hours for 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 **PHONE:** 780 539 2738
OFFICE: J214 **E-MAIL:** lrawluk@nwpolytech.ca

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

CALENDAR DESCRIPTION: Atoms and molecules, states of matter, chemistry of the elements. **Restricted to Engineering students.**

PREREQUISITE(S)/COREQUISITE: Chemistry 30 or equivalent

REQUIRED TEXT/RESOURCE MATERIALS: Recommended textbook is Chemistry 2nd 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.

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: 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.alberta.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.

EVALUATIONS:

Quizzes	5%
Lab Reports	10%
Lab Exam	10%
Midterm	30%
Final Exam	45%

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	95-100		C+	2.3	67-69
A	4.0	85-94		C	2.0	63-66
A-	3.7	80-84		C-	1.7	60-62
B+	3.3	77-79		D+	1.3	55-59
B	3.0	73-76		D	1.0	50-54
B-	2.7	70-72		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:

Assignments will be electronically distributed on a roughly weekly basis. Complete solutions will be available a short while later. A practice quiz will be part of each seminar; solutions to quizzes will be posted shortly after the quiz is completed. Online quizzes will further supplement course learning.

Attendance of all lectures and seminars is strongly recommended. Laboratory attendance for 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 ACADEMIC MISCONDUCT:

Academic Misconduct will not be tolerated. For a more precise definition of academic misconduct and its consequences, refer to the Student Rights and Responsibilities policy available at https://www.nwpolytech.ca/about/administration/policies/index.html

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