NORTHWESTERN POLYTECHNIC

DEPARTMENT OF SCIENCE

COURSE OUTLINE – WINTER 2026

CH1050 (A3): INTRODUCTORY UNIVERSITY CHEMISTRY II – 3.8(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, text (780-897-1051), or Zoom

CALENDAR DESCRIPTION: Rates of reactions, thermodynamics and equilibrium, electrochemistry, modern applications of chemistry. **Restricted to Engineering students.**

PREREQUISITE(S): CH1030

COREQUISITE(S):

REQUIRED MATERIALS: Recommended textbook is Chemistry 2nd Ed. by OpenStax College; this is an Open Educational Resource available at no charge. The required Lab manual is Introductory University Chemistry II (Chem 102 and 105), 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: Upon successful completion of this course, students will be able to:

- Apply the principles of chemical kinetics to find rates of reactions, and explore mechanisms and activation energy of simple chemical changes.
- Use the principles of equilibrium to interpret behaviors of weak electrolytes, buffer solutions, and solubility of sparingly soluble salts.
- Apply the above principles to evaluate the pH of acids of different strengths.
- Use thermodynamic concepts to explain spontaneity in chemical reactions, and the role of thermodynamic functions in describing equilibrium systems.
- Understand and use the principles of oxidation-reduction and electrochemistry including Voltaic and electrolytic cells.
- Use laboratory techniques related to volumetric analysis and simple instrumentation including an introduction to spectroscopy.

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.

** For courses with alpha (letter) grading, a 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%
	Laboratory Reports	10%
	Laboratory Exam	10%
	Midterm Exam I	19%
	Midterm Exam II	19%
	April Final Exam	37%

GRADING CRITERIA:

Please not 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:

Chemical Kinetics (Chapter 12; Pages 657 – 720) *6 – 8 hours*

- Reaction Rates
- Rate laws
- Determining rate law form
- Integrated rate law
- Arrhenius equation
- Reaction mechanisms
- Stead-State approximation
- Catalysis

Chemical Equilibrium (Chapter 13; Pages 721 – 762) *4 –6 hours*

- Equilibrium condition
- Mass-action expression and the equilibrium constant
- Heterogeneous equilibria
- Applications of the equilibrium constant
- LeChatelier's Principle

Acids and Bases (Chapters 14; Pages 763 – 822) 9 – *11 hours*

- The nature of acids and bases
- Acid strength and the pH scale
- Calculating pH of strong/weak acids
- Bases
- Salts
- Mixtures of weak acids and bases
- Polyprotic acids
- Effect of structure upon acid strength
- Common ion effect
- Buffer systems
- Acid/base titrations
- Acid/base indicators

Solubility Equilibria (Chapter 15; Pages 823 – 859) *3 – 5 hours*

- Slightly soluble salts
- Complex ion equilibria

Thermochemistry (Chapter 5; Pages 231 – 280) *3 – 5 hours*

- Types of energy; work and heat
- First Law of Thermodynamics
- Enthalpy; endothermic and exothermic processes
- Thermodynamics of an Ideal Gas
- Calorimetry
- Hess's Law
- Standard enthalpy of formation

Thermodynamics (Chapter 16; Pages 861 – 895) *3 –5 hours*

- Entropy and The Second Law of Thermodynamics
- Entropy of the system and the surroundings
- Free Energy and Equilibrium

Electrochemistry (Chapter 17; Pages 897 – 939) *3 – 5 hours*

- Redox reactions and standard electrode potentials
- Galvanic cells and spontaneous redox reactions
- Cell potential, electrical work, and free energy
- Dependence on concentration – the Nernst Equation
- Batteries
- Electrolytic cells

STUDENT RESPONSIBILITIES: Students must pass the laboratory (reports + exam) portion to receive a passing grade in this course. Electronic distribution of assignments occurs on a roughly weekly basis. Complete solutions will be available a short while later. An online quiz will be conducted most weeks.

Attendance to all lectures and seminars is strongly recommended. Laboratory attendance to each specific experiment is compulsory. Official documentation 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 the classroom.

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/polytechnic-leadership/policies-directory

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