



**DEPARTMENT OF SCIENCE
COURSE OUTLINE – WINTER 2020**

**CH1050 (A3): INTRODUCTORY UNIVERSITY CHEMISTRY II – 3.8 (3-1-1.5)
82.5 HOURS OVER 15 WEEKS**

INSTRUCTOR: Les Rawluk

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OFFICE HOURS: Monday + Wednesday 10:00 – 11:30; Tuesday + Thursday 9:00 – 9:45

CALENDAR DESCRIPTION: Chemical kinetics and equilibria, acid-base and solubility equilibria, electrochemistry and thermodynamics. **Restricted to Engineering students.**

PREREQUISITE: CH1030

REQUIRED TEXT/RESOURCE MATERIALS: *Chemical Principles* by Steven S. Zumdahl and Donald J. DeCoste, 8th edition, Brooks/Cole, Cengage Learning, 2016. Required Lab manual is Introductory University Chemistry II (Chem 102 and 105), published by the University of Alberta, 2019/2020 edition.

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

COURSE OBJECTIVES: Students are enabled to strengthen their understanding of basic chemical principles pertaining to rate, spontaneity, extent, and direction of various chemical reactions. Critically thinking about these concepts as they apply to chemical problems will strengthen the student's knowledge of chemical topics.

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.
- Understand and use the principles of oxidation-reduction and electrochemistry including Voltaic and electrolytic cells.
- Use thermodynamic concepts to explain spontaneity in chemical reactions, and the role of thermodynamic functions in describing equilibrium systems.
- Use laboratory techniques related to volumetric analysis and simple instrumentation including an introduction to spectroscopy.

TRANSFERABILITY: UA, UC, UL, AU, AF, CU, CUC, KUC

***Warning:** Although we strive to make the transferability information in this document up-to-date and accurate, **the student has the final responsibility for ensuring the transferability of this course to Alberta Colleges and Universities.** 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> or, if you do not want to navigate through few links, at <http://alis.alberta.ca/ps/tsp/ta/tbi/onlineSearch.html?SearchMOde=S&step=2>

** 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 Exam	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:

Chemical Kinetics (Chapter 15; Pages 600 – 647) 6 – 8 hours

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

Chemical Equilibrium (Chapter 6; Pages 169 – 196) 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 7 & 8; Pages 197 – 277) 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 8; Pages 278 – 298) 3 – 5 hours

- Slightly soluble salts
- Complex ion equilibria

Thermochemistry (Chapter 9; Pages 299 – 343) 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 10; Pages 344 – 396) 3 –5 hours

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

Electrochemistry (Chapter 11; Pages 397 – 435) 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: A student must pass the laboratory portion to receive a passing grade in this course.

No electronic equipment capable of connecting online is accessible during exams.

Electronic distribution of assignments occurs 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. 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 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 College Calendar at <http://www.gprc.ab.ca/programs/calendar/> or the College Policy on Student Misconduct: Plagiarism and Cheating at <https://www.gprc.ab.ca/about/administration/policies>

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