DEPARTMENT OF SCIENCE

COURSE OUTLINE – WINTER 2020

CH1020 (A3): INTRODUCTORY UNIVERSITY CHEMISTRY II – 3(3-1-3)

105 HOURS OVER 15 WEEKS

INSTRUCTOR: Les Rawluk **PHONE:** 780 539 2738

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

CALENDAR DESCRIPTION: Lectures include chemical kinetics, thermochemistry, thermodynamics, equilibrium, acids and bases, electrochemistry, and coordination chemistry.

PREREQUISITE(S)/COREQUISITE: CH1010

REQUIRED TEXT/RESOURCE MATERIALS: Recommended textbook is Chemistry 2nd Ed. by OpenStax College; this is an Open Educational Resource available at no charge. 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.
- 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: UA, UC, UL, AU, AF, CU, GMU, KUC, CUC

***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:	February Midterm Exam	18%
	March Midterm Exam	18%
	April Final Exam	37%
	Quizzes	5%
	Laboratory Reports	12%
	Laboratory Exam	10%

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	90-100		C+	2.3	67-69
A	4.0	85-89		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) *4 – 5 lectures*

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

Chemical Equilibrium (Chapter 13; Pages 721 – 762) *3 – 4 lectures*

- 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) 6 – *7 lectures*

- 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) *2 – 3 lectures*

- Slightly soluble salts
- Complex ion equilibria

Thermochemistry (Chapter 5; Pages 231 – 280) *2 – 3 lectures*

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

Thermodynamics (Chapter 16; Pages 861 – 895) *2 –3 lectures*

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

Electrochemistry (Chapter 17; Pages 897 – 939) *2 – 3 lectures*

- 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

Transition Elements and Coordination Compounds (Chapter 19; Pages 1029 – 1076) *2 lectures*

- Properties of the transition metals
- Coordination compounds
- Structure of coordination compounds
- Crystal field theory

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.
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.