

CHEMISTRY 105 – Introductory University Chemistry II

3 credits, 4 hours lecture, 3 hours lab every second week

3.8 Engineering units for the University of Alberta

Rates of reactions, thermodynamics and equilibrium, electrochemistry and modern applications of chemistry.

Prerequisite: CHEM 103

NOTE: Chemistry 105 is restricted to Engineering students only

Instructor

Dr. Sorin Nita

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Office Hours

Monday 2:00 PM – 4:00 PM

Wednesday 2:00 PM – 3:00 PM

Thursday 2:00 PM – 3:00 PM

Friday 2:00 PM – 3:00 PM

Hours of Instruction

Lecture:	Monday	1:00 PM – 2:00 PM	Room 224
	Wednesday	1:00 PM – 2:00 PM	Room 224
	Friday	9:00 AM – 10:00 AM	Room 224
	Friday	1:00 PM – 2:00 PM	Room 224

Laboratory:	Tuesday	2:00 PM – 5:00 PM	Lab 236
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Required Resources

1. **General Chemistry: Principles & Modern Applications**; Petrucci, Herring, Madura, Bissonnette; Pearson Canada Inc., Toronto, Ontario, 2017, 11th edition, ISBN 978-0-13-293128-1.
The 10th edition of this textbook is also acceptable.
2. **Alternative Open Source Textbook: Chemistry 2e**; Flowers, Theopold, Langley, Robinson; OpenStax, 2019, ISBN 978-1-947172-61-6.
Download for free at <https://openstax.org/details/books/chemistry-2e>
3. **Chemistry 103/105 Laboratory Manual**; Keyano College, 2019/2020 edition.
The old editions of the lab manual are not acceptable.
4. **Student Lab Notebook with Permanent Binding**; Hayden-McNeil, Plymouth, Michigan, ISBN 978-1-930882-00-3
5. A non-programmable scientific calculator (Sharp EL-531, used for exams, is recommended).
6. Extra-long lab coat.

Course Outcomes

Upon successful completion of this course, the student shall be able to:

- Perform analytical and chemical kinetics experiments using laboratory equipment, and use proper laboratory safety procedures
- Explain chemical processes using physical chemistry methods, either employing the kinetics approach or the thermodynamics approach
- Analyze chemical equilibrium using Le Châtelier's principle, and perform equilibrium calculations using an ICE table for acid-base equilibria, solubility equilibria, and complex ion equilibria
- Explain electronic configurations of coordination compounds using Crystal Field Theory, and correlate it with their properties like color and paramagnetic-diamagnetic character
- Understand how the electrochemical cells operate, calculate their standard potential, and correlate the potential to the ionic concentrations in each half cell using Nernst equation

Evaluation

Assignments	10%
Laboratory	20%
Midterm Exams	22.5%
Final Exam	47.5%
Total	100%

A grade of C- is required for progression or transfer.

Students are required to attend and complete all labs. Unexcused absence from any lab period or failure to submit a lab report may result in a failing grade in the course.

Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory Progression	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor Minimum Pass	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

Proposed Schedule of Topics**1. Chemical Kinetics****textbook chapters**

- Reaction rates and rate laws 20.1-20.3
- Integrated rate laws 20.4-20.7
- Arrhenius model and reaction mechanism 20.8-20.10
- Catalysis 20.11

2. Equilibrium

- Gas-phase equilibria 15.1-15.2
- ICE table and equilibrium calculations 15.3-15.5
- Le Châtelier's principle 15.6-15.7
- Acid-base equilibria 16.1-16.9
- Buffers, Indicators 17.1-17.6
- Solubility, precipitation, complex ion equilibria 18.1-18.9

3. Coordination Chemistry

- Coordination compounds and isomers 24.1-24.4
- Localized electron model, Crystal field theory 24.5-24.9

4. Thermodynamics

- First law: energy, heat and work 7.1-7.5
- Enthalpy, bond energies and calorimetry 7.3-7.6
- Hess' law, Sources of Energy 7.7-7.9
- Second and third laws: entropy and spontaneity 13.1-13.4
- Free energy, work and equilibrium 13.5-13.8

5. Electrochemistry

- Voltaic cells, cell potentials 19.1-19.2
- Free energy and electrical work 19.3
- The Nernst equation 19.4
- Applications: batteries, corrosion, electrolysis 19.5-19.8

Please Note:

Date and time allotted to each topic is subject to change.

Performance Requirements**Student Responsibilities**

It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College credit calendar.

More specific details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

Laboratory Safety

In the science laboratories, safety is important and therefore students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

Before entering the lab, students are responsible reviewing the lab manual and relevant Safety Data Sheets for the purpose of evaluating risks associated to health. Some hazards used in the laboratory may have additional risks to those with pre-existing medical conditions.

Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a students' learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and / or notes that may be due.

Academic Misconduct

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own
- The use of unauthorized aids in assignments or examinations (cheating)
- Collusion or the unauthorized collaboration with others in preparing work
- The deliberate misrepresentation of qualifications
- The willful distortion of results or data
- Substitution in an examination by another person
- Handing in the same unchanged work as submitted for another assignment
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online tutorial found on ilearn.keyano.ca. Then print the certificate, sign it, and show it to each of your instructors. Your course work will not be graded until you show this signed certificate.

Specialized Supports

The Student Academic Support Services (SASS) department: Accessibility Services, Skill Centre, Wellness Services and Student Life Department work together to support student success at Keyano College.

Accessibility Services (CC167) supports student success through group and individualized instruction of learning, study and test taking strategies, and adaptive technologies. Students with documented disabilities, or who suspect a disability, can meet with the Learning Strategists to discuss accommodation of the learning barriers that they may be experiencing. Students who have accessed accommodations in the past are encouraged to visit our office at their earliest opportunity to discuss the availability of accommodations in their current courses. Individual appointments can be made by calling 780-791-8934.

Skill Centre (CC119) provides a learning space where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff. Students visiting the centre have access to one-to-one or group tutoring, facilitated study groups, and assistance in academic writing. The Skill Centre's Peer Tutor program provides paid employment opportunities for students who have demonstrated academic success and want to share what they have learned. Tutoring is available free to any students registered at Keyano College on a drop in basis, from 8:30 am to 5:00 pm Monday through Friday. Additional evening hours are subject to tutor availability and are posted in the Skill Centre.

Wellness Services (CC260) offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. The Mindfulness Room in CC260 is available as a quiet space for students to relax during regular office hours. Wellness Service welcomes students to participate in any of the group sessions offered throughout the academic year addressing such topics as Mindfulness and Test Anxiety. Individual appointments can be made by calling 780-791-8934.

Student Life Department (CC210) is a place for students to go when they don't know who else can answer their questions. The staff will help students navigate barriers to success and if they don't know the answer, they will find it out. Student success is directly affected by how connected a student feels to their college. The student life department is there to help students get connected.

Please watch your Keyano email for workshop announcements from our Student Academic Support Services team.