

 Yukon University	School of Science
	CHEM 111
	Chemical Energetics and Dynamics
	Term: Winter 2026 Number of Credits: 3
Course Outline	

INSTRUCTOR: Ernie Prokopchuk, PhD

E-MAIL: eprokopchuk@yukonu.ca

Phone: (867) 668-8865

CLASS: Mon & Wed 10:30 am -12:20 pm

ROOM: A2202

OFFICE: A2015

OFFICE HOURS: Wed & Thurs 1:00-3:00 pm
or by appointment, or any time my door is open

LAB: Tuesday 2:30 – 5:20 pm

ROOM: A2803

COURSE DESCRIPTION

This course is a continuation of the study of the fundamental principles of chemistry with an emphasis physical chemistry. Topics of study include chemical equilibrium, acid/base chemistry, chemical kinetics, nuclear chemistry, thermodynamics and electrochemistry. The course also includes some descriptive chemistry of a selection of main group elements and transition metals. The mandatory laboratory component of the course will illustrate and reinforce most of the topics presented in the lectures.

Successful completion of this course with CHEM 110 will satisfy the requirement for 6 credits of first year chemistry in the science and engineering degree programs at most Canadian and US universities.

COURSE REQUIREMENTS

Chemistry 110, or permission of the instructor.

Students are expected to come to this course with an understanding of the topics covered in Chemistry 110 as many of these basic concepts will serve as the foundation for this course.

EQUIVALENCY OR TRANSFERABILITY

Receiving institutions determine course transferability. Find further information at:

<https://www.yukonu.ca/current-students/transfer-credit>

LEARNING OUTCOMES

Upon successful completion of this course, students will:

- have further developed their critical thinking skills
- be able to discuss chemical concepts, theories, and examples of fundamental chemistry
- have developed basic hands-on laboratory skills in experimental investigation of chemical questions

COURSE FORMAT

Weekly breakdown of instructional hours

Three hours lecture, one hour tutorial (incorporated into the lectures), three hours lab. It is expected that this course will require 4 – 6 hours/week (on average) of homework, readings, and studying for the lecture component and 3 – 5 hours/week for readings, prelabs, and reports for the lab component. The actual time required will depend on the individual and some may need more or less time than these estimates.

Delivery format

Classes are delivered in-person (face-to-face) as a blend of lecture and tutorial allowing for an opportunity to practice solving calculation-based problems related to the material being covered in class.

I will record classes in order to provide you with a way to revisit material covered in class. This may be helpful while studying, to review a topic covered in class, or to fill in a gap in your notes. This also provides greater flexibility to anyone who is unable to make the occasional class due to work, family commitments, or other reasons, but please note that these recordings are *not intended to be a substitute for regular class attendance*. If the technology fails, recordings may not be available for a given day. The videos will only be available on the course Moodle page, accessible only to registered students and select university staff.

I will regularly post material on the course LMS (Moodle) page. This material will include links to lecture capture videos, pdfs of the notes written on the screen, assignments, course announcements, links to content in the online textbooks, suggested practice problems, and other useful or interesting material related to the course. Please be aware that all course announcements and any other notifications generated by Moodle are sent to your Yukon University email address. It is essential that you regularly check this email account or set it to automatically forward to your preferred email account.

Labs are a mandatory component of the course. You are expected to attend all lab sessions, complete the experiments, and submit the required reports. Something may come up to prevent you from attending a lab. If this happens, please let me know as soon as possible (before the lab is even better) so we can determine the best solution. You cannot submit a report for the missed lab unless we have already made arrangements for that. The lab grade will be determined based on lab quizzes, pre-lab exercises, lab performance, and the lab reports. Expectations for the labs are outlined in the lab manual.

EVALUATION

Assignments	10 %
Term Test 1 (60 minutes)	15 %
Term Test 2 (60 minutes)	15 %
Final Exam	30 %
Laboratory	30 %
Total	100%

Students must pass both the laboratory component (15/30) and the lecture component (35/70) in order to pass the course

Attendance

While attendance is not graded, I strongly recommend regular attendance. There is a strong correlation between regular attendance and academic performance, but this must also be balanced with your own health and well-being. If you miss a class due to illness or some other commitment, the posted videos and notes can be helpful, and I am always willing to answer any questions you may have about the missed content.

Assignments

There will be at least 8 assignments due on an approximately weekly basis. Assignments are worth 10% of the final grade based on the total mark obtained on all assignments. Assignments will involve a variety of questions or problems related to the course material. These provide you with an opportunity to get some practice with the concepts, and feedback on your understanding of the material. You will have at least one week to complete each assignment. I will accept and grade assignments after the due date and up to the moment when I return marked assignments to the class. Any assignment submitted after that point will usually receive a mark of 0 (but I will provide corrections/feedback) though I am willing to consider the specific situation and possibly grant an extension for exceptional circumstances (health, family emergency, cultural practices, etc).

Tests and Examinations

There will be two 60-minute term tests (February 4, 2026 and March 4, 2026) held during scheduled class time. Each test is worth 15% of the final grade. Please note that typically after the term tests the remaining class time will be used for a lesson. The final examination (sometime between April 18-24, 2026, 3 hours), worth 30% of the final grade, will cover material from the entire course, potentially including some content from the lab.

Laboratory component

The laboratory component of the course is worth 30% of the final grade. This will be based on lab performance (10%), pre-lab questions (10%), lab quizzes (5%), and lab reports (75%). The specific evaluation criteria for the lab are detailed in the lab manual.

COURSE WITHDRAWAL INFORMATION

If you find yourself struggling with the course at any point in the semester, please come and see me. For many students, a bit of extra help is enough to succeed in this course. However, if your current circumstances are such that a withdrawal, or converting to audit, is the best option for you, you have until March 5, 2026 to do so without academic penalty.

TEXTBOOKS & LEARNING MATERIALS

As a step to making education more affordable, we will be using [OpenStax](#) and [LibreTexts](#) as our textbooks. The OpenStax materials include a student solution guide to the textbook problems (free login required). Some copies of traditional textbooks will be placed on reserve in the library. You will need access to a computer or other suitable device, as internet access is required for this course.

The Laboratory Manual for Chemistry 111 will be provided. You will need to provide your own notebook for use as a Lab Notebook. This must be a separate notebook, not the one you are using for course notes. More information will be provided in the first lab session.

Students will need to provide their own safety glasses. These MUST be ANSI Z87.1 (or later) or CAS 94.1 (or later) certified; this information will be on the packaging. These are the same kind of safety glasses required in the Trades and can be purchased wherever such safety equipment is sold. If your safety glasses have coloured lenses, they must not inhibit your ability to see clearly in the lab.

Lab coats are mandatory, and students should be purchased ahead of time. Cotton lab coats are best, but most expensive. Blends are acceptable but 100% polyester must be avoided as these are quite flammable. Also, if buying a lab coat online, please be sure it is a real lab coat and not a costume item which will not provide adequate protection.

ACADEMIC INTEGRITY

Students are expected to contribute toward a positive and supportive environment and are required to conduct themselves in a responsible manner. Academic misconduct includes all forms of academic dishonesty such as cheating, plagiarism, fabrication, fraud, deceit, using the work of others without their permission, aiding other students in committing academic offences, misrepresenting academic assignments prepared by others as one's own, or any other forms of academic dishonesty including falsification of any information on any Yukon University document.

Please refer to Academic Regulations & Procedures for further details about academic standing and student rights and responsibilities.

Note that generative artificial intelligence tools such as Chat GPT can be useful in the same way as a web search or Wikipedia. They can be a starting point but cannot be used to do the work for you. Simply copying the output from something like Chat GPT and submitting it as your own work will be considered plagiarism the same as if you copied directly from a book, webpage, or classmate. Furthermore, appropriate referencing is expected in submitted work. If generative AI is used as part of your writing workflow, this must be indicated either as a footnote or endnote describing the use/purpose of the AI. Please be aware that generative AI cannot be used as a reference source itself. Chat GPT and similar tools are not actual sources of information and should not be referenced as such, much as you would not reference the results of a web search. References should be to the published scientific literature, or, when appropriate, to the popular scientific media.

ACCESSIBILITY AND ACADEMIC ACCOMMODATION

Yukon University is committed to providing a positive, supportive, and barrier-free academic environment for all its students. Students experiencing barriers to full participation due to a visible or hidden disability (including hearing, vision, mobility, learning disability, mental health, chronic or temporary medical condition), should contact [Accessibility Services](#) for resources or to arrange academic accommodations: access@yukonu.ca.

TOPIC OUTLINE

Week	Unit	Topic
1 2	1	Chemical Kinetics - rates and rate laws - reaction mechanisms - catalysis
3	2	Chemical Equilibria - equilibrium condition - equilibrium constant - Le Châtelier's Principle
4 5	3	Acid-Base Equilibria - acid/base definitions - acid/base strength - pH - titrations and pH curves - polyprotic acids - ionic acids and bases
6 7	4	Applications of Aqueous Equilibria - buffers - solubility - Lewis acids and bases - complexation
8 9	5	Thermochemistry - energy and thermodynamics - enthalpy and Hess' Law - energy sources - bond energy

		- phase changes
9 10	6	Spontaneity, Entropy, and Free Energy - spontaneous processes - 2 nd law of thermodynamics - entropy changes in reaction - free energy and reactions - thermodynamics and equilibrium
11 12	7	Electron-transfer Reactions - balancing redox reactions - galvanic cells - standard reduction potentials - cell potential - applications
13	8	Descriptive main group chemistry

**Specific dates of topic coverage may be subject to change. Some topics may not be covered depending on time constraints.*