Yukon University	**School of Science**
	CHEM 210 **Organic Chemistry I**
	Term: Fall 2024 **Number of Credits: 3**

Course Outline

INSTRUCTOR: Ernie Prokopchuk, PhD
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Phone: 668-8865

OFFICE: TBD
OFFICE HOURS: Wed & Fri 1:30-3:00 pm
or any time my door is open or by appointment

CLASS: Tues & Thurs 9:00 -10:20 am
ROOM: TBD

LAB: Thursday 2:30-5:20 pm
ROOM: A2803

COURSE DESCRIPTION

Students are introduced to fundamental concepts of structure and bonding in organic molecules, including stereochemistry and chirality while undertaking a systematic study of various classes of organic molecules including alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, and epoxides. The mechanisms of common reactions are covered with an emphasis on understanding how the movement of electrons is used to rationalize these processes. Students are also introduced to the design of organic syntheses. The mandatory labs introduce students to standard organic laboratory techniques while further illustrating concepts covered in class.

COURSE REQUIREMENTS

CHEM 110 with a minimum grade of C. CHEM 111 is recommended.

Students are expected to come to this course with an understanding of concepts covered in CHEM 110 including atomic structure, electron configurations, molecular formulas, basic bonding theory (Lewis structure and hybridization), and intermolecular forces. Much of this material will be briefly reviewed in class.

EQUIVALENCY OR TRANSFERABILITY

Receiving institutions determine course transferability. Find further information at:
https://www.yukonu.ca/current-students/transfer-credit

LEARNING OUTCOMES

After completing this course, students will be able to

- provide the IUPAC name for organic molecules and provide the structure of a molecule based on its name
- recognize common classes of organic molecules and be familiar with their physical and chemical properties
- accurately predict the outcomes of common reactions involving saturated and unsaturated hydrocarbons, alcohols, ethers, and epoxides
- use electron arrows to describe reaction mechanisms for common reactions of saturated and unsaturated hydrocarbons, alcohols, ethers, and epoxides
- design multistep organic syntheses using reactions that students know
- carry out common organic laboratory procedures using common organic laboratory equipment
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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).

Classes will be recorded with the intent to provide students with a way to revisit material covered in class. This may be helpful while studying or to review a topic covered in class. This also provides greater flexibility to students who are unable to make the occasional class due to work, or other commitments, 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. Videos will only be available via the course Moodle page and only to students registered in the course.

Material will regularly be posted on the course LMS, Moodle. This material will include links to lecture capture videos, assignments, course announcements, links to online content, including the textbook on and suggested practice problems on OpenStax, a pdf of everything written on the screen during class, 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. Students are expected to attend all lab sessions, complete the experiments, and submit the required reports. If a lab period is missed, the report for that experiment cannot be submitted unless arrangements are made with the instructor. 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, it is strongly recommended. There is a strong correlation between regular attendance and academic performance.

Assignments

There will be at least 5 assignments due on an approximately bi-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. You will have at least one week to complete each assignment. Late assignments will not be accepted (receiving a mark of 0) once graded assignments have been returned to the class, which usually happens at the next class.

Tests and Examinations

There will be two 80-minute term tests (October 3, 2023 and November 2, 2023) held during scheduled class time. Each test is worth 15% of the final grade. The final examination will be held between December 12 and 19, 2024 (exact date/time to be determined), 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

The final day to withdraw without academic penalty is November 4, 2024.

TEXTBOOKS & LEARNING MATERIALS

As a step to making education more affordable, we will be using John McMurry's Organic Chemistry, available for free on OpenStax. This includes the textbook, practice problems, and solution manual.

Other supporting information may be provided from LibreText. You will need access to a computer or other suitable device, as internet access is required for this course.

The Laboratory Manual for Chemistry 210 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 clear (not tinted) and 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.

Lab coats are mandatory, and students should purchase these 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.

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. Generative AI cannot be used as a reference source. 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	1	**Review of fundamental concepts** - bonding - formal charges - resonance - polar bonds
2	2	**Functional groups** - haloalkanes - alcohols and phenols - ethers - amines - aldehydes & ketons - carboxylic acids, esters, amides - nitriles Physical properties and structure - intermolecular forces IR spectroscopy
3	3	**Acids and bases** - Bronsted acids/bases - acid base equilibria - structure and acidity - solvent and acidity - organic bases - Lewis acids/bases - carbocations and carbanions
4,5	4	**Alkanes and cycloalkanes** - nomenclature - properties - conformational analysis

		- ring stability - substituted cycloalkanes – cis/trans isomerism - polycyclic alkanes - reactions - halogenation and radical mechanisms - alkyl radicals
6, 7	5	**Stereochemistry** - chirality and entantiomers - biological importance - identifying/naming enantiomers - molecules with multiple chiral centres - Fischer projections - D and L designations for monosaccharides - resolution of enantiomers

8, 9	6	**Nucleophilic substitutions and elimination reactions**
		- alkyl halides
		- nucleophiles
		- leaving groups
		- SN2 reactions
		  - kinetics and mechanism
		  - stereochemistry
		- SN1 reactions
		  - mechanism
		  - stereochemistry
		- Elimination reactions of alkyl halides
		  - E2 reaction
		  - E1 reaction

10, 11	7	**Alkenes and Alkynes** - (E)/(Z) diastereomers - relative stabilities

		- synthesis of alkenes and alkynes - carbocation stability and rearrangements - terminal alkyne acidity - conversion of alkynes to nucleophiles - hydrogenation reactions - organic synthesis Electrophilic addition reactions - regiochemistry – Markovnikov's rule - stereochemistry of addition - alcohol formation - haloalkane formation - halohydrin formation carbenes oxidation and oxidative cleavage of alkenes and alkynes radical additions to alkenes
12	8	**Alcohols** - structure and nomenclature - properties - synthesis - from alkenes - from carbonyls - by reduction - reactions - conversion of alcohols to alkyl halides
13	9	**Ethers and Epoxides** - synthesis - reactions

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