

# Department of Chemistry Course Outline

## Fall 2023, CHEM 3020, Intermediate Organic Chemistry I, 3.0

**Course Instructor:** Christine Le

**How to address me:** Professor Le or Dr. Le

**Personal Pronouns:** (she/her/hers)

**Email:** [cmle@yorku.ca](mailto:cmle@yorku.ca)

Note: If you have a question or would like to talk with me, you can send an email, visit me during student hours (see below), or approach me after class.

*Email subject line must include 'CHEM 3020'*

**Student Hours:** Tuesday & Thursday, 4pm-5pm

### What are 'Student Hours'?

Student hours are dedicated times through the week for the course instructor to meet with YOU. Pop in to introduce yourself, ask questions about the course, or discuss content from the course.

**Note:** If these times don't work for you, email me and we can arrange an alternate time to meet.

**Course Format:** In-person

\*Lectures and tutorials will be recorded (no live-streaming)

**Prerequisites:** CHEM 2021 3.0

**Office Location:** Chemistry Building, **CB 346**

**Class Times and Locations:**

Mondays, 11:30 am – 12:20 pm: **DB 0006**

Wednesdays, 11:30 am – 12:20 pm: **CLH C**

Fridays, 11:30 am – 12:20 pm: **LSB 105**

**Tutorial Time and Location:**

Thursdays, 12:30 pm – 1:20 pm: **LSB 103**

**Study Spaces on Campus:**

<https://www.library.yorku.ca/web/ask-services/book-a-study-seatspace-at-the-libraries/>

**Course TAs:**

**Dusty Cadwallader** (he/him/his)

[dustyc94@yorku.ca](mailto:dustyc94@yorku.ca)

**Maryam Jabbarpoor** (she/her/hers)

[maryamjp@yorku.ca](mailto:maryamjp@yorku.ca)

**\*Disclaimer:** Recordings are meant to be used as study aids and NOT a replacement for attending in-person lectures/tutorials. I cannot guarantee the quality of these recordings due to various reasons (background noise, echo in room, technical difficulties, etc.)

## Land Acknowledgement

York University recognizes that many Indigenous Nations have longstanding relationships with the territories upon which York University campuses are located that precede the establishment of York University. York University acknowledges its presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been cared for by the Anishinabek Nation, the Haudenosaunee Confederacy, and the Huron-Wendat. It is now home to many First Nation, Inuit, and Métis communities. We acknowledge the current treaty holders, the Mississaugas of the Credit First Nation. This territory is subject of the Dish with One Spoon Wampum Belt Covenant, an agreement to peacefully share and care for the Great Lakes region.

## Welcome to this Course!

**Course Description:** The purpose of this course is to deepen students' appreciation of organic reactions and spectroscopy and to prepare students for further study in organic chemistry, pharmaceutical chemistry, and biochemistry. The course will solidify and build upon the basic skills of CHEM 2021.

### Course Level Learning Objectives

Upon successful completion of this course, students should be able to:

1. Apply the basic theory behind modern spectroscopic methods towards the characterization of organic molecules.
2. Assign  $^1\text{H}$  and  $^{13}\text{C}$  NMR signals of organic structures based on expected chemical shift ranges, integration, and splitting patterns.
3. Differentiate between homotopic, enantiotopic, and diastereotopic pairs of atoms or groups, and understand how these relationships affect the appearance of NMR spectra.
4. Interpret  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra to aid in the elucidation of organic structures, building on the fundamentals of IR, NMR, and MS covered in CHEM 2021.
5. Apply the principles of acid-base theory towards the generation of carbanion nucleophiles and their use in diverse bond-forming reactions.
6. Apply the principles of aromatic reactivity and carbonyl chemistry towards the synthesis and transformations of heterocyclic compounds.
7. Predict reaction products based on the factors that govern chemoselectivity, regioselectivity, and stereoselectivity for a variety of transformations.
8. Provide missing reactant, intermediates, and/or products in a synthetic scheme with partial information provided.
9. Illustrate reasonable reaction mechanisms using curved arrow notation from a given set of reactants and conditions.
10. Devise reasonable multistep forward synthetic routes towards a given target using the principles of retrosynthetic analysis.

### Lecture Topics (Tentative)

Based on Organic Chemistry, 2nd edition by Clayden, Greeves, and Warren (Oxford University Press)

#### Module 1: Advanced Organic Structure Elucidation\*

- i. **Chapter 3** – Determining organic structures
- ii. **Chapter 13** –  $^1\text{H}$  NMR: Proton nuclear magnetic resonance
- iii. **Chapter 18** – Review of spectroscopic methods

\*Will be supplemented by additional handouts/materials from various sources.

**Module 2: Carbonyl Chemistry**

- i. **Chapter 8** – Acidity, basicity, and  $pK_a$
- ii. **Chapter 20** – Formation and reactions of enols and enolates
- iii. **Chapter 22** – Conjugate addition and nucleophilic aromatic substitution
- iv. **Chapter 25** – Alkylation of enolates
- v. **Chapter 26** – Reactions of enolates with carbonyl compounds: the aldol and Claisen reactions

**Module 3: Heterocyclic Chemistry**

- i. **Chapter 28** – Retrosynthetic analysis
- ii. **Chapter 29** – Aromatic heterocycles 1: reactions
- iii. **Chapter 30** – Aromatic heterocycles 2: synthesis
- iv. **Chapter 31** – Saturated heterocycles and stereoelectronics (time-permitting)

**Inclusive teaching statement:**

I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, and class.

All students in the class, the instructor, and any guests should be treated with respect during all interactions. I will continually strive to create inclusive learning environments and would therefore appreciate your support and feedback.

**Learning Materials****Required Textbook:**

- 1) Clayden, Jonathan; Greeves, Nick; Warren, Stuart (2012). *Organic Chemistry*. 2<sup>nd</sup> Edition. New York, Oxford University Press.
  - Hardcopy textbooks are available at the York University Bookstore
  - Electronic textbooks are available through Day1Digital (180-day rental) – Link in eClass

*A copy of this textbook has been placed on reserve at Steacie Library (24 h loan period)*






**Optional Textbooks:**

- 1) Clayden *et al.*, Solutions Manual to accompany Organic Chemistry 2/e.
  - Hardcopy textbooks are available at the York University Bookstore
  - Electronic textbooks are available through Day1Digital (180-day rental) – Link in eClass
- 2) Pavia, Donald L.; Lampman, Gary M.; Kriz, George S.; Vyvyan, James A (2015). *Introduction to Spectroscopy*. 5<sup>th</sup> Edition. Stamford, Cengage Learning.

*A copy of this textbook has been placed on reserve at Steacie Library (24 h loan period)*

Website (eClass): <https://eclass.yorku.ca/course/view.php?id=95290>

### Technology Checklist:

 <p>An internet-enabled computer to access eClass and materials</p>	 <p>Access to reliable internet</p>	 <p>A mobile device for in-class iClicker polling</p>	 <p>Zoom software installed on computer*</p>	 <p>Microphone*</p>
<p>*In the event of online delivery of the course</p>				

**Note:** If you don't have access to a computer, webcam, microphone, consider borrowing a laptop from York U, financial aid from York, and single workspaces available for student use on campus at the library.

## Assessment in this Course

Research about learning strongly suggests that the most important factor in learning is doing the work of reading, writing, recalling, practicing, synthesizing, and analyzing. Learning happens best when people actively engage material on a consistent basis, and that is why I have high standards in this course. I am confident that, with appropriate effort, you **all** can meet those standards.

## Grade Breakdown

Tentative until September 20, 2023

COMPONENT	GRADE VALUE
MIDTERM 1	22%
MIDTERM 2	22%
QUIZZES	16%
PARTICIPATION	5%
FINAL EXAM	35%

You must write the final exam to pass the course!

## Quizzes

There are 6 quizzes total in the course. The quizzes will be multiple choice and completed on eClass. For each quiz you have ~ 1 week to complete it. The **top 4 quizzes** will be used to tabulate your total quiz mark in the course. This means that if you miss a quiz for **any reason**, there is no need to worry, as only the top 4 quizzes will be used for your total quiz mark. Due to this generous policy, no additional accommodations or extensions will be granted.

The dates provided below are tentative.

QUIZ #	TENTATIVE MODULES	OPENS	CLOSES
1	Module 1	Sep 14	Sep 21
2	Module 1	Sep 26	Oct 3
3	Module 2	Oct 17	Oct 24
4	Module 2	Oct 26	Nov 2
5	Module 3	Nov 9	Nov 16
6	Module 3	Nov 23	Nov 30

## Participation

Participation will be assessed as class attendance and in-class participation during lecture hours using iClickers starting September 20, 2023. Accuracy will not be required for these polling questions and collaboration is encouraged. Tutorials are optional (i.e., no participation marks), although attendance is highly recommended to master the course content.

Students will be expected to set up an iClicker account using the iClicker link on the eClass site (do not add the course through the separate iClicker app).

This is free to York students. Make sure to register your account using your full name and the same email address used on eClass. Otherwise, participation marks will be difficult or impossible for us to assess.

GRADE VALUE	ATTENDANCE REQUIRED
5%	Participation in <b>≥80%</b> of lectures will earn full marks (5%)
<b>PRORATED</b>	Participation in <b>≤79%</b> will earn a prorated fraction of 5% towards final grade

Because only 80% participation is required for full marks, there will be no accommodation for technical issues, absences, religious obligations, forgotten devices, dead batteries, or any other unforeseen circumstances.

## Midterm Exams

Both midterms will be in-person. The midterms may consist of fill-in-the-blank, matching, short-answer, and problem-solving questions similar to the ones we have practiced in tutorial/class, and the textbook and worksheet problems assigned for homework.

### Missed midterm policy:

If you miss a midterm due to an unpredicted reason, you do not need to bring physician's documentation. Please email me (cmle@yorku.ca) as soon as possible. There will not be any makeup exams and the weight of midterm will be automatically shifted towards the final exam.

MIDTERM	GRADE VALUE	DATE	TIME	LOCATION
1	22%	Friday, Oct 6, 2023	11:30 am – 12:20 pm	TBD
2	22%	Friday, Nov 10, 2023	11:30 am – 12:20 pm	TBD

### Final Exam

The final exam will take place during the Final Exam period and will be scheduled by the Registrar's Office.

- **Students must write the final exam in order to pass the course.**
- Students missing the final exam will be expected to write the deferred exam (to be scheduled by the course coordinator) before the end of the following term.
- No final grade will be submitted for students missing the final exam.
- Unless a deferred exam is written, the final grade will automatically revert to F.

## University Policies

### Important Dates

**Drop Deadline:** November 8, 2023 (last day to drop without course on transcript)

**Course Withdrawal Deadline:** December 5, 2023 (course still appears on transcript with 'W')

### Grading Scheme

In accordance with the York University Undergraduate Calendar Regulations, the letter grades assigned in undergraduate courses at York conform to the descriptions and grade ranges shown here: <https://calendars.students.yorku.ca/2022-2023/grades-and-grading-schemes>

### Academic Honesty and Integrity

Academic misconduct undermines the values of honesty, trust, respect, fairness, and responsibility that we expect in this class. York University provides supports such as academic integrity workshops to ensure that all students understand the norms and standards of academic integrity that we expect you to uphold.

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>). The Policy affirms the

responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. Please review and familiarize yourself with the policy.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve your research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website:

**Examples of actions that do not adhere to York's Academic Integrity Policy include:**

- Plagiarism (passing off someone else's work as your own)
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams
- Uploading work to third party repository sites (e.g., Course Hero, One Class, etc.)
- Scanning, sharing, uploading, or publishing exams, tests, or scholarly work

For more information on what academic integrity is and why it is important see:

<https://spark.library.yorku.ca/academic-integrity-what-is-academic-integrity/>. Information on the process of investigations into breaches of academic honesty:

<https://spark.library.yorku.ca/academic-integrity-breach-of-policy-on-academic-honesty/>

**Important Note from the FSc Committee on Examinations & Academic Standards (CEAS):**

Numerous students in Faculty of Science courses have been charged with academic misconduct when materials they uploaded to third party repository sites (e.g., Course Hero, One Class, etc.) were taken and used by unknown students in later offerings of the course. Whenever a student submits work obtained through an external site (e.g., Course Hero, Chegg), the **submitting student will be charged with plagiarism** and the **uploading student will be charged with aiding and abetting**. To avoid this risk, students are urged not to upload their work to these sites.

**Assistance for Students (Academic and Well-Being)**

**Academic Advising\***: <https://www.yorku.ca/science/academic-advising/> \* Departments also offer program-specific advising. Check with your Department's Undergraduate Office.

**Centre for Human Rights, Equity, and Inclusion**: <https://rights.info.yorku.ca>

**Centre for Indigenous Students Services**: <https://aboriginal.info.yorku.ca/>

**Good2Talk 24-hour Ontario Student Helpline**: 1-866-925-5454 /Text: GOOD2TALKON to 686868

**Keep.meSAFE**: <https://myssp.app/keepmesafe/ca/home>

**Learning Commons** (general academic learning supports including library research, time management, study skills, career planning, etc.): <https://learningcommons.yorku.ca/>

**Peer Tutoring**: <https://www.yorku.ca/colleges/bethune/get-help/peer-tutoring/>

**Sexual Violence Response and Support**: <https://thecentre.yorku.ca>

**Student Counselling, Health & Well-being**: <https://counselling.students.yorku.ca/>

**Support Services for International Students:** <https://yorkinternational.yorku.ca/international-student-support/>

**Writing Services:** <https://www.yorku.ca/colleges/bethune/get-help/writing/>

**York University Student Services:** <https://family.yorku.ca/student-services/#SCD>

**York University Student Well-being Resources:** <https://www.yorku.ca/well-being/resources/students/>

## Accessibility

York University is committed to principles of respect, inclusion, and equality of all persons with accessibility needs across campus. The University provides services for students with accessibility needs (including physical, medical, learning, and psychiatric needs) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with accessibility services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with accessibility services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

**Additional information is available at the following websites:**

**Student Accessibility Services:** <https://accessibility.students.yorku.ca>

**York Accessibility Hub:** <http://accessibilityhub.info.yorku.ca/>

## Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course Director immediately. To arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete and submit an accommodation request form at least 3 weeks before the exam period begins. <https://secure.students.yorku.ca/pdf/religious-accommodation-agreement-final-examinations.pdf>

## Student and Instructor Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person



to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at <http://secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/>.

Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University.

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:

<http://2022-2023.calendars.students.yorku.ca/2022-2023/student-conduct-and-responsibilities>