Chemistry
UNIVERSITY OF TORONTO

CHM 1040H: Modern Organic Synthesis

Winter 2023 Course Syllabus

I TEACHING TEAM

INSTRUCTOR (WEEKS 1 – 6) AND COURSE COORDINATOR

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INSTRUCTOR (WEEKS 7 – 12)

Name: Prof. Rob Batey
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II COURSE OVERVIEW

COURSE DESCRIPTION:
The goal of the course is to build your understanding of key concepts in synthetic organic chemistry and to broaden your knowledge of the field through in-depth discussions of advanced topics. Communication skills (written and oral) and analysis of the primary research literature will also be points of emphasis.
The course will consist of two sections.
Section 1: Carbohydrate chemistry (weeks 1–6)
Section 2: Selected Topics in Reactive Intermediates, Molecular Orbital Theory, and Conformational Analysis (weeks 7–12)

COURSE INFORMATION:
Course Times and Location
Thursdays, 9:10–11:00 AM, SS2125 (Sidney Smith Hall, 100 St. George Street)

COURSE WEBSITE:
Important information, including class notes, assignments and test/examination information will be posted on the course website on Quercus (http://q.utoronto.ca). Please check the course website regularly for announcements and postings.

STUDENT LEARNING OUTCOMES:

Upon successful completion of the course, students will be able to:

- recognize and understand the reactivity patterns of important classes of organic compounds;
- be able to propose mechanisms and/or catalytic cycles for complex organic reactions;
- develop skills in problem-solving for organic synthesis and mechanistic analysis;
- improve their ability to communicate concepts and findings related to organic chemistry through visual and oral means;
- improve their ability to research and interpret the primary research literature;
- be familiar with the structures and reactivity patterns of carbohydrate derivatives;
- devise feasible strategies for the synthesis of complex organic molecules.

PREREQUISITE COURSE(S):
This course assumes you have an advanced understanding of structure, bonding, reactivity and mechanism in organic chemistry. You are expected to be familiar with topics and concepts discussed in CHM342 and CHM440 (consult the instructors of these courses for course syllabi), and to be comfortable reading primary literature articles in the organic synthesis field.

READINGS:
Notes and required readings will be posted on the course website.

Supplemental: It may be useful to refer to advanced organic chemistry textbooks (e.g., *Organic Chemistry* by Clayden, Greeves & Warren; *Advanced Organic Chemistry* by Carey and Sundberg) to refresh your memory or improve your background on concepts/topics related to the course.

III COURSE ORGANIZATION

Lectures will be held in person each week. You are strongly encouraged to attend and participate in the lectures. Recordings of lectures will be made available via the Quercus site.

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

SECTION	TOPICS	Dates
1	***Carbohydrate Chemistry.*** Nomenclature, structure and spectroscopy of sugars. Selection protection of OH groups in carbohydrates. *De novo* synthesis of carbohydrates. Glycosylation reactions and mechanisms. Oligosaccharide synthesis. **Oral exams:** week of Feb 13	Jan 12–Feb 16

	Written assignment due Mar 2, 9:10 AM	
	Winter Session reading week (no class)	Feb 23
2	***Reactive intermediates and aspects of molecular orbitals and conformational analysis in organic chemistry.*** *Major types of reactive intermediates. Fundamental structure and reactivity considerations. Aspects of MO theory and conformational analysis. Applications and examples in complex molecule synthesis.* **Lecture Note Assignment due** April 17th, 9:00 AM **Exam (Section 2):** exam period Apr 18-30th (tbd)	Mar 2–Apr 6

IV EVALUATION/GRADING SCHEME

SECTION 1. Students will conduct a comparative analysis of two papers from the primary research literature in the area of carbohydrate chemistry. The papers should be chosen to illustrate contrasting approaches to a given problem (e.g., contrasting syntheses of an oligosaccharide target, distinct methodologies that allow access to an important structure, mechanistic studies that use different approaches, etc.). The evaluation of this work will have two components: (i) an oral examination in which students present their chosen papers; and (ii) a written report.

SECTION 2. Students will produce a short set of "lecture notes" in a powerpoint/pdf format on a relevant topic (but one which was not directly covered in the lecture material). There will also be an exam that covers the material discussed in the lecture notes.

MARK BREAKDOWN

Section 1: Oral exam (15%) + Written report (35%) = 50%
Section 2: Final Exam (25%) + "Lecture Notes" (25%) = 50%

ASSIGNMENT/EVALUATION DATES

Oral exams (Section 1): Week of Feb 13, 2023
Written report (Section 1): Due on March 2, 2023 at 9:10 AM in SS2125. Hard copies only, please. Electronic submissions will not be accepted.
Final exam (Section 2): Exam Period = Apr 18-29th, 2023 (exact date, tbd)
"Lecture Notes" (Section 2): Due on April 17th, 2023 at 9:00 AM. File upload (Quercus).

V COURSE POLICIES

- Each member of this course is expected to maintain a:

(i) professional and respectful attitude during all course activities.
(ii) personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
(iii) collection of notes recorded independently based on concepts covered in course activities (students registered with Accessibility Services requiring a class note-taker will have access to this accommodation)
(iv) familiarity with the university policy on Academic Integrity (overleaf)

- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. As course instructors, we will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment, or hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.

- E-mails will generally be responded to within 48 h on weekdays. E-mails will only be accepted if: (1) You send it from your utoronto.ca email; (2) You identify the course code in the email subject, include your name, and University of Toronto student number; (3) No attachments are sent, unless requested, or if official university correspondence is being forwarded (i.e. a letter detailing accommodations); (4) You are aware that organic chemistry can be talked about much more effectively through student hours rather than by emails and that sending emails is not a substitute for attending classes.

  Please only email *ONE* person on the CHM1040 instructional team, depending on the nature of your concern.

- Late assignment submissions will be subject to a deduction of 10% per day for a maximum of five days. **Please note that completed assignments will not be accepted after this period.**

- If you wish to request re-grading of any course work, please e-mail the course instructor responsible for setting the assessment.

VI TECHNOLOGY REQUIREMENTS

- Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/

- Advice for students more broadly regarding online learning is available here: https://onlinelearning.utoronto.ca/getting-ready-for-online/

- This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.

VII INSTITUTIONAL POLICIES & SUPPORT

ACADEMIC INTEGRITY:
Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In laboratory reports:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any report. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post assignments or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.**

On term tests:

1. Using or possessing unauthorized aids. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test**

questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.

2. Looking at someone else's answers or collaborating/discussing answers during a term test.
3. Misrepresenting your identity.

In general academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.academicintegrity.utoronto.ca/).

COPYRIGHT:

Parts of this course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session. Course videos and materials belong to your instructor, the University, and/or other source depending the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without explicit permission of the instructor. For questions about recording and use of videos in which you appear, please contact your instructor.

If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here: https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/

ACCESSIBILITY NEEDS:

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact Accessibility Services as soon as possible.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES:

Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an

assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

ADDITIONAL SERVICES & SUPPORT:
The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information for Technical Support/Quercus Support

ACKNOWLEDGEMENT OF TRADITIONAL LANDS:
We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.