Welcome to CHM 247H! A very warm welcome to the University of Toronto's second introductory organic chemistry course which is primarily designed for life science and health science students! CHM 247H focuses on many fundamental principles of the discipline, with particular attention paid to the applications and major reactions of organic compounds: central concepts regarding organic reaction mechanisms, synthesis, and structure elucidation via spectroscopic methodologies will be covered in detail. The course features a significant amount of problem-solving: both during and outside formal classroom, tutorial, and laboratory time. All of this will build extensively on material discussed in prerequisite courses (CHM 135H + CHM 136H, or CHM 151Y), and a **thorough understanding of first-year concepts covered in these courses is essential for success.** CHM 247H is recommended for students enrolled in any science program that involves a small amount of chemistry. *Students taking any Chemistry specialist program (including Biological Chemistry) or who will be including a substantial amount of chemistry in their degree (such as those following a Chemistry major program) are either required to or strongly encouraged to take CHM 249H (Organic Chemistry) instead.* The specific 200-level courses offered by the Department of Chemistry and how they are connected to each Chemistry program are listed here: chemistry.utoronto.ca/current-students/second-year-chemistry-course-requirements.

Class meets	Tuesday, Wednesday and Thursday 2:00 pm – 4:30 pm; in room SS2118
Instructor	Dr. Ahlem Bensari (ahlem.bensari@utoronto.ca) Student (Office) hours: directly after class on Wednesdays for as long as there are questions
Lab coordinator	Dr. Marvin Morales (marvin.morales@utoronto.ca) Students (Office) hours: Wednesdays and Thursdays, 10 – 11 am in LM217 Dr Mima Staikova, for the computational experiment only. Students (Office) hours: details on contact information and available help are posted in the Computational experiment module
Course administrator	Mr. Alex Fernandes (alex.fernandes@utoronto.ca)

1. **Learning Outcomes:** Upon successful completion of CHM 247H, students will be able to

- demonstrate an understanding of and apply the structural elucidation techniques of infra-red spectroscopy and nuclear magnetic resonance spectroscopy *in order to* determine the atom connectivity of unknown molecules.
- recognize important classes of functional groups and use knowledge of their reactivity patterns to predict the products of organic transformations.
- demonstrate an understanding of the fundamental principles underlying the behavior of organic compounds as nucleophiles and electrophiles.
- formulate fundamental organic reaction mechanisms by appropriately describing electron flow *in order to* write reasonable mechanisms for new reactions.
- apply organic reactions and their conditions *in order to* propose synthetic pathways for given target compounds of interest.

- safely conduct chemical experiments in the laboratory using a variety of classical techniques using modern instrumentation.
- collect, record, and interpret laboratory results.

Through these learning outcomes, successful students will appreciate the pivotal roles that organic chemistry principles play in the life and health sciences by understanding their connections to biologically- and industrially important substances. They will also value the contributions of chemists to the development of organic chemistry as a scientific discipline, through the highlighting of achievements made by many scientists.

Prerequisite Courses: This course assumes you have a fundamental and thorough understanding of content presented in CHM 135H (Chemistry: Physical Principles) and especially CHM 136H (Introductory Organic Chemistry I). CHM 151Y (Chemistry: The Molecular Science) is a suitable alternative prerequisite course. CHM 247H may be counted towards certain Chemistry programs of study, although as noted previously it is either required or highly recommended that students enrolled in such programs take CHM 249H instead. *It is highly recommended that you interact with the Quercus LEC section website "First-Year Organic Chemistry Resource Videos" if you feel you need to brush up on first-year course content.*

2. Reference Material:

Required Textbook: *ORGANIC CHEMISTRY; by John McMurry.;* (9th edition) which is accompanied by the Student Solutions Manual. This is the same textbook as required in CHM 136H and CHM 151Y. These two items are available in print copy or digital format through the U of T bookstore at a reduced cost. *Links to course material are also available on the CHM 247 LEC Quercus site.*

Molecular Model Kit: A molecular model kit will be useful for most of the course. The "Molecular Visions" kit by Darling Models is recommended for this, as well as other undergraduate organic chemistry courses at U of T, although other model kits are helpful too. Models may be used as an aid in all online and in-person assessments and are available for purchase from the ChemClub (office: Lash Miller Laboratories room 203) or through U of T bookstore.

3. Course Arrangements and Tentative Schedule

Classes: class notes will be available on the CHM 247 course website on Quercus ahead of each class. *These notes are to be completed in class and as such you should attend all CHM 247H classes* since it is here that fundamental course content will be presented and elucidated. Be sure to come prepared by having done some textbook reading (getting an overview of what will be discussed in class ahead of time is highly recommended!) and having printed out the class notes posted on the Quercus LEC section website in advance. Note that simply reading the posted class notes and/or textbook is not a substitute for attending classes! It is essential that you attend the in-person classes in order to solidify your understanding of the fundamental course material (planned class content is described in next page). Recordings of lectures will be provided for a limited amount of time on the LEC Quercus site. These recordings are intended to help students with unexpected absences – we understand that it may not be possible to attend every class. **Class recordings will only be available for one week after they are posted**, they will not be reuploaded or distributed. Recordings are intended to help students with unexpected absence from class, to *supplement the in-person classes, encourage all students to keep up with course material, and cannot replace the classes as a mechanism to help you learn*.

Tentative Course Schedule
(may be subject to adjustment)

Term dates: July 4 – August 14
Last date to drop class without academic penalty: July 31

Week	Dates	Lecture Topics	Textbook sections	Tutorials	Labs
1	July 4	Course information; IR Spectroscopy	Ch 12.5 - 8	—	—
	July 5	Finish up IR & start NMR Spectroscopy	Ch 13.1-6; 13.9-11	—	
	July 6	NMR Spectroscopy (cont'd)	Ch 13.1-6; 13.9-11	TUT #1	
2	July 11	NMR Spectroscopy (cont'd)	Ch 13.1-6; 13.9-11	—	Exp 1
	July 12	Finish NMR Spectroscopy, start Alkynes	Ch 13.1-6; 13.9-11	TUT #2	
	July 13	Alkynes; Retrosynthesis Analysis	Ch 9	TUT #3	
3	July 17	**Quiz 1 (9:00 am – 9:00 pm; 30 min)** — online			
	July 18	Aromatic Substitutions	Ch16	—	Exp 2
	July 19	Finish up Aromatic Substitutions	Ch 16	TUT #4	
	July 20	**Term Test 1 (2:30 pm – 3:45 pm, 75 min)** — no class		TUT #5	
4	July 25	Alcohols and Phenols	Ch 17	—	Exp 3
	July 26	Ethers, start Nucleophilic Additions	Ch 18.1-3; 18.5-9	TUT #6	
	July 27	Carbonyl: Nucleophilic Additions	Ch 19 excluding 19.12	TUT #7	
5	July 31	**Quiz 2 (9:00 am – 9:00 pm; 30 min)** — online		—	
	August 1	Carboxylic Acids and Derivatives	Ch 20.1-2, 4-8; Ch 21.1-7, Ch 21.10	—	Exp 4
	August 2	Carbonyl: α-Substitution	Ch 22	TUT #8	
	August 3	**Term Test 2 (2:30 pm – 3:45 pm, 75 min)** — no class		TUT #9	
6	August 8	Carbonyl: α-Substitution; condensation	Ch 23.1-12	—	Exp 5
	August 9	Carbonyl: condensation	Ch 23.1-12	TUT #10	
	August 10	Amines	Ch 24.1-4, Ch 24.6-8	TUT #11	

Tutorials: Tutorials begin the week of Monday 10th July and run twice weekly, every Wednesday and Thursday. **Tutorials are an integral part of the CHM 247H instruction and regular attendance is EXPECTED of Students**. They are led by experienced graduate student teaching assistants and have a problem-solving format.

Tutorial questions are posted for on Quercus will form the primary basis of each tutorial session. **Active student participation in problem-solving through completion of tutorial questions is linked to success in learning organic chemistry**: these questions, as well as the assigned textbook problems, will provide you with an important opportunity for self-assessment, help you make sure you are keeping up with the course materials, and are essential preparation for tutorials. Please be aware that the "model" answers to tutorial questions will NOT be posted, so that you are encouraged to problem-solve and to attend each tutorial where you may ask questions or seek clarification of fundamental concepts. Throughout the semester, each tutor will be available for as long as there are questions immediately following each tutorial session. You should however refrain from emailing course content questions to tutors (such questions should be).

Laboratories are a mandatory aspect of this course. The purpose of the laboratory activities is to introduce you to some fundamental techniques in the context of organic reactions that you will learn about in the classroom component of CHM 247H. The laboratories include four "wet" organic experiments, offered only in-person throughout the semester; and one computational experiment, which is conducted virtually.

The laboratories run once a week and will begin during the week of Monday 10th July. Each student will be assigned to a demonstrator group number and a bench number for all wet experiments. The detailed schedule of the laboratories and the demonstrator group numbers/bench numbers will be posted at your CHM 247H Quercus PRA section website during the first week of classes. *If you have not yet registered for a practical section on ACORN, please do so as soon as possible. If ACORN registration is no longer available, please* ***immediately*** *contact the laboratory instructor Dr. Marvin Morales (contact information on p. 1).*

The first laboratory you will perform is a computational experiment. When the Computational Laboratory module becomes available on your PRA section you will work independently on the experimental tasks, performing computations of compound properties on WebMO, the Department of Chemistry computer server. Each student will use their own user ID and password (details on your PRA section) and will have their own WebMO directory where the computational jobs will be executed and collected. Students will have about a week to finish as many of the required calculations as possible (during this period, students can do them in their own time). At the end of the week, you will have a one-hour virtual meeting (mandatory) with a teaching assistant to discuss the laboratory topic, potential problems you might have had with the computations, and discuss details of the report. The reports are to be uploaded on the PRA section and are due one week after the TA virtual meeting. After this, the four wet experiments are performed in person in room LM 217. Each student will perform all of the experiments in the same demonstrator group and on the same assigned bench space on the weekday of your PRA section in weekly intervals.

Students are expected to attend all laboratory sessions. If you cannot attend a laboratory session for a reason beyond your control, you need to complete an absence declaration on ACORN and notify Dr. Morales as soon as you are able (no later than three days after the missed session). In such a case you will be excused from the experiment and your grade for it will be assigned as an average of the other laboratory grades. If you happen to miss a second session for reasons behind your control, you will need to meet with Dr. Morales for special arrangements. In such a case your grade for the missed experiment will be tied to your performance in all graded components of CHM 247H. **To pass the course a personal attendance at a minimum of three "wet" experiments is required.** ***No make-up laboratory sessions will be offered*****.**

In advance of each laboratory, we expect you to read all assigned materials, watch the relevant videos, and complete a quiz. After each laboratory, you will submit a written report. The corresponding reports are due the following week. Reports can only be submitted with data collected in-person during your lab session. **All laboratory materials and reports will be handled within your CHM 247H Quercus PRA section website:** if you have any questions or concerns about any aspect of the laboratory activities, please contact Dr. Morales.

4. Course Evaluation & Grading Scheme

This course will offer you a variety of activities to assess your learning at multiple points throughout the course. These assessment activities will provide opportunity for you to demonstrate your learning relative to the course learning outcomes and receive feedback to guide future learning.

Quizzes (x2)	**(10 %)**	July 17 and July 31; 9:00 am – 9:00 pm; online on Quercus
Term Tests (x2)	**(35 %)**	July 20th and August 3 from 2:30 pm – 3:45 pm
Lab	**(25 %)**	based on lab quizzes, lab performance and lab reports
Final Exam	**(30 %)**	To be scheduled during the examination period—August 17-25.

Quizzes (x2): you will complete two, 30 min online, quizzes on Monday 17th July and Monday 31st July on Quercus within a 12-hour time window between 9:00 am – 9:00 pm. Note that if both quizzes are written, the highest grade earned on the two quizzes will count as the total quiz grade out of 10%. Each quiz will be multiple-choice in nature. **IMPORTANT**: if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affect the availability of or functionality, it may be necessary to revise the timing or weighting of the online quizzes.

Term Tests (x2): There will be two, 75 min term tests respectively on Thursday 20th July and Thursday 3rd August. Each test will not be explicitly cumulative. The highest test score earned on term tests will be weighted at 20% and the other test weighted at 15%. There will be no class on term test days. Exam location will be communicated as soon as information become available. Format, structure, and material covered in the test will be announced nearing the actual test date.

Final Exam: a final 3h cumulative exam will be written during the examination period, August 17-25, and scheduled by the faculty of Arts and Science and could occur on the last day. Exam-related details will be announced as they become available.

Students who miss a test must complete the Acorn Absence Declaration AND email the course administrator Mr Alex Fernandes *(contact information on p. 1)* with a screenshot of the Acorn Absence Declaration as soon as possible (ideally within 2 days of missing the test) and no later than a week of the absence to get consideration for a missed test. Please note that there are no make-up quizzes or term tests.

Consideration for one missed test will result in the other test accounting for 20% of the final mark and the final exam accounting for 45% of the final mark. For students missing both term tests, the mark for the missing tests will be replaced by the final exam.

5. Learning Support and Assistance

The following resources may help you identify and address needs and difficulties you may encounter in this course as they arise. We are here to help you succeed and advance your learning. Do not hesitate to reach out and I encourage you take advantage of the resources available to you in time of need.

Student (Office) Hours: these set times give you the opportunity to discuss the course content with your instructor and other students. Practical-related concerns or questions should be during the practical sessions or practical office hours. Tutorial and other course content-related questions should be reserved and asked after class on Wednesdays, during regular tutorial sessions or tests help sessions.

Recognized Study Groups: If you would like further support in a small-group online environment, you are also highly encouraged to investigate the Recognized Study Group (RSG) Program (https://sidneysmithcommons.artsci.utoronto.ca/recognized-study-groups/join). These are small, student-led study groups of up to eight classmates enrolled in the same course within the Faculty of Arts & Science. RSGs meet online through Quercus or Zoom each week: more information can be found on the provided link about this initiative.

Additional Services and 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 in Quercus can be found on the left-hand column under "Help", then "Quercus Support Resources".

6. Important Course Policies

Each member of this course is expected to maintain a:

- professional and respectful attitude during all course activities, including classes, laboratories, tutorials, and other online activities.
- personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
- 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)
- familiarity with the university policy on Academic Integrity

General CHM 247H LEC course website: q.utoronto.ca (in your Quercus Dashboard, click on "CHM 247H Summer 2023"). **You will also need to access your CHM 247H Quercus PRA section website for laboratory information. Please check the Quercus course websites (LEC & PRA) regularly (daily!) for**:

- general course information
- class notes
- tutorial questions
- all important announcements related to assessments, laboratories, and tutorials
- other useful resources to help support your success

E-mail and Getting Help: Email will generally be responded to within 24 hrs. on weekdays. Email will only be accepted if: (1) You send it from your utoronto.ca account; (2) You identify yourself in the email subject as a student in CHM 247H and include your name and University of Toronto student ID number; (3) No attachments are sent, unless official university correspondence is being forwarded (e.g., a letter detailing academic accommodations or a screenshot of an ACORN absence declaration); (4) You are aware that organic chemistry can be discussed much more effectively through tutorial sessions, or in student hours rather than by email, and that sending emails is not a substitute for attending classes.

Important: be sure to email only ONE person within the CHM 247H instructional team, depending on the nature of your concern. Please do not send emails through the Quercus internal email system (they will not be responded to): the contact information for the course instructors/laboratory coordinator is listed on p. 1.

- For course content questions, please ask during your tutorial or during the student hours after each class. Please keep in mind that email is not the mechanism to receive explanations of course material.
- Any questions on *laboratory* content can be directed to your TA during regular lab time, asked during the PRA help hours.
- Please include your full name and student number, and your PRA section for lab related questions, making sure to use your UTORONTO email address. Keep the language and tone of your email professional.
- **Note that the tutorial and practical teaching assistants (TAs) cannot provide any assistance via email.**

Absences: Students who are absent from class for any reason (e.g., COVID, other illness or injury, family situation) and who require consideration for missed coursework should report their absence through the online absence declaration. The declaration is available on ACORN under the Profile and Settings menu. **You must also email the course administrator with a screenshot of the Acorn Absence Declaration indicating which graded work you missed as soon as possible and within two days and no later than a week of your absence to receive consideration. Please include your full name, student number, LEC and PRA section in your email.**
There are no make-up quizzes or term tests in CHM 247H, and there are no make-up laboratory sessions.

Late Work Submissions: laboratory reports and all online assessment responses are to be submitted through CHM 247H Quercus websites only. Late laboratory reports will be deducted at 20% per day, and assessment responses will not be accepted at all after the due date/time. Please be aware that completed laboratory reports will not be accepted once graded work has been distributed to the rest of the class.

Equity and Diversity: 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 members of the course teaching team, 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 and 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.

Recordings: Aspects of this course, including your participation, may be recorded on video and if so 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 sources depending on the specific facts of each situation and are protected by copyright: for questions about recording and use of videos in which you appear please contact your instructor. *Students may not create audio or video recordings of classes with the exception of those students requiring an accommodation for a disability, who should contact the instructor prior to beginning to record classes for written permission.* Students creating unauthorized audio recording of classes violate an instructor's intellectual property rights and the Canadian Copyright Act. Students violating this agreement will be subject to disciplinary actions under

the Code of Student Conduct. Course videos may not be reproduced or posted or shared anywhere other than the official CHM 247H Quercus websites and should only be used by students currently registered in the course.

7. Technology Requirements

This course, particularly the lab (quiz and report submissions) and course quizzes require the use of computers, and technical issues are possible. When working on an assignment, 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 e.g. hard-drive failures, corrupted files, lost computers, etc. We encourage you to spend a moment at the start of the semester to make a plan for what you would do if you lost access to the computer that you primarily intend to use, which will help ensure that you are prepared for this unlikely possibility.

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/

8. Institutional Policies and Support

Accessibility: The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs. Students with diverse learning styles and needs are welcome in CHM 247H. If you have a disability that may require accommodations, please feel free to approach Accessibility Services as early as possible to register and receive accommodations.

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 outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

1. In laboratory reports

- Using someone else's ideas or words without appropriate acknowledgement. Normally, students will be required to submit their written course work (i.e. lab reports) to the University's plagiarism detection tool, Ouriginal, for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their work to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any report. Please note that the use of websites (such as Chegg.com) to post laboratory report material/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. On quizzes and term tests:
   - Using or possessing unauthorized aids. Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz 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.
   - Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
   - Misrepresenting your identity.
3. In general academic work:
   - Falsifying institutional documents or grades.
   - 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/)

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 Alex Fernandes, the CHM 247H course administrator, **before** the session/assignment date to arrange accommodations.

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.