

# Organic Reaction Mechanisms (CHMC41H3)

## Winter 2015

### University of Toronto at Scarborough

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**Welcome to CHMC41!** This course is intended for students who have completed the two-semester introductory course in organic chemistry and wish to expand their understanding of structure and reaction mechanisms in organic chemistry. The laboratory experiments are designed to complement the topics covered in lectures. Organic chemistry is a perfect combination of theory and practice, as you will experience them. CHMC41 is going to require some hard work, but you will find your efforts rewarding. Modern organic chemistry is about your daily life and your future, and CHMC41 provides the theory and practice to make you prepared to explore this fascinating field.

Students enrolled in CHMC41H must have previously successfully completed CHMB41 and CHMB42. Please carefully read through this document before we get started. It contains important information which will help ensure you have all the tools you'll need to succeed in this course.

**Team:**

**Instructor:**

Prof. Xiao-an Zhang  
SW511  
Email: [xazhang@utsc.utoronto.ca](mailto:xazhang@utsc.utoronto.ca)  
Office Hours: Friday 3:00-6:00 pm

**Lab Coordinators:**

Dr. Lana Mikhaylichenko  
SW-633A or SW162 (Office hours posted on Blackboard)  
Email: [mikhay@utsc.utoronto.ca](mailto:mikhay@utsc.utoronto.ca)

**Lecture Schedule and Locations:**

Friday 9-11 am in SW 128

**Textbook:**

*Advanced Organic Chemistry Part A: Structure and Mechanisms*, 5th Ed., by Francis A. Carey and Richard J. Sundberg, Springer. The textbook is available online with **free** access on campus: <http://link.springer.com/book/10.1007/978-0-387-44899-2/page/1>

Students can download the pdf files and read them at home. The hardcopy can be purchased from the UTSC Bookstore or online by yourself.

**Suggested References:**

- (1) *Organic Chemistry*, Paula Yurkanis Bruice, Pearson Education, Inc.
- (2) *March's Advanced Organic Chemistry: Reactions, mechanisms and structure*, 6th Edition, Michael B. Smith and Jerry March, Wiley.
- (3) *Organic Chemistry*, 2nd Edition, Jonathan Clayden, Nick Greeves, and Stuart Warren, Oxford University Press

These recommended (not compulsory) readings are available in the UTSC Bookstore, online or the Reserves section of the UTSC Library.

***Molecular models:***

Several topics in CHMC41 involve stereochemistry or conformational analysis. Molecular model kit and software are valuable tools for visualization and manipulations of compounds in three-dimensions. The molecular model kit is a traditional tool, which may be available to purchase from the UTSC bookstore (optional). In addition, you can obtain a Chem3D software as a component of the package coming with **ChemBioDraw Ultra 14**. If you are a first time user, you need to get yourself registered using a valid UofT email account and ID. More information is available at the A.D. Allen Chemistry Library homepage:

<http://www.chem.utoronto.ca/facilities/chemlib/index.htm>.

***Website:***

CHMC41 will be using Blackboard to release and archive course-related information including: class announcements, lecture slides, contact information and occasionally some useful outside resources. In addition, class emails will regularly be sent via Blackboard. ***In order for you to receive these emails, you must have a valid “utoronto.ca” email account registered with ROSI.***

***Email Policy:***

Please use a valid “utoronto.ca” account for all CHMC41 correspondence. Emails received from other accounts will not necessarily be answered. When composing your email, please use professional language. Be sure to include the course code in the subject line and sign the email with your first and last name, as well as your student ID. Your email will be answered as soon as possible (likely within 48 hours, unless it is a weekend or holiday). When emailing Dr. Lana Mikhaylichenko, please state which course you are talking about. Dr. Lana Mikhaylichenko is running multiple courses so she needs some context. Questions on the lab material should be directed to Dr. Lana Mikhaylichenko, or your TA.

***Term Test:***

There will be one midterm test written outside of class time, which will count as 25% of your final grade. The exact date, time, location and material to be tested will be announced as soon as they are available.

***Policy on Missed Tests:***

***Please note that there will be no make-up exams for a missed test.*** Should you miss a term test due to a legitimate reason, you must submit appropriate documentation within one week of your absence. If the reason is medical, an official UTSC medical form should be downloaded from

[http://www.utsc.utoronto.ca/~registrar/resources/pdf\\_general/UTSCmedicalcertificate.pdf](http://www.utsc.utoronto.ca/~registrar/resources/pdf_general/UTSCmedicalcertificate.pdf).

**If no acceptable documentation is received, you will receive a grade of zero for that test.**

With a validated absence, the value of the missed test will be added to your final exam. Please note that on page 386 of the 2014/2015 UTSC Calendar it states: "You cannot petition to withdraw from a course on the grounds that no work was returned to you before the last day to withdraw without academic penalty if this is the result of your having been given an extension to complete your work for reasons relating to you and not the rest of your class."

**Final Examination:**

There will be a *cumulative* exam written during the end of semester exam period, which will count as 40% of your final grade. The exact date, time and location will be announced as soon as they are available. ***Please note that if you miss the Final Exam, you must petition the Registrar's Office to write a make-up exam in the next formal exam period.*** Check the UTSC Calendar for instructions and deadlines.

**Labs:**

The laboratory component of CHMC41 is compulsory, and, ***in order to pass the course, you must also pass the lab component.***

Please arrive *on time* for your labs and come *prepared*. The experiments are designed such that a *well-prepared* student can complete the experiment in the allotted time. If you haven't read over the procedure ahead of time and made sure that you understand each step, it will likely be difficult for you to finish your work on time. As a suggestion, I recommend that you prepare a point-form version of the lab procedure before coming to each lab.

**Lab Schedule:** Please read the Introductory part of your lab manual and check the Blackboard Lab Schedule part every week before coming to the lab.

**Lab Manual:**

Lab Manual for this course will be sold during the break at your first lecture and at the end of it. Please read an announcement at the course Blackboard page for more details. The introductory part of the Lab Manual has a tentative lab schedule and all the information you need to know about these labs. Please read it before coming to the actual labs.

**Lab Coats and Safety Glasses:**

Lab coats and safety glasses must be worn at all times in the laboratory. Contact lenses may not be worn in the laboratory. You must bring goggles, a lab coat and a notebook to the labs by yourself. All of these can be purchased from the UTSC Bookstore. You may purchase a lab notebook from the dollar store. The smallest size would be about 6" X 8". We will provide you with graph paper if needed. The notebook cannot have pages that are easily torn out. Please make sure your name is in the book as well as on your calculator. (Dr. Lana Mikhaylichenko have many left over from last term that were not picked up). *You will not be allowed to work in the laboratory unless you are wearing approved eye protection and a lab coat.*

**Absences from the laboratory:**

If you need to miss a laboratory period for any valid reason, you must immediately report it to both your TA and to the appropriate Lab Instructor, but no later than 48 hours after the lab. If the reason for your absence is medical then you must provide documentation for this. Normally, this would be in the form of an official UTSC medical note completed by your doctor

([http://www.utsc.utoronto.ca/~registrar/resources/pdf\\_general/UTSCmedicalcertificate.pdf](http://www.utsc.utoronto.ca/~registrar/resources/pdf_general/UTSCmedicalcertificate.pdf));

Documentation should be provided as soon as possible so that a makeup lab can be scheduled, provided that room can be found in another lab section. ***If no reason for your absence is made, a mark of zero will be given for that lab.***

**Lab quiz:**

It will be a short 10 min quiz at the beginning of each lab. Please read a Laboratory Schedule section on a Blackboard for more information about each lab.

**Lab Website:**

All your lab grades for this course and any lab announcements will be on the Blackboard course page.

**Ancillary fees:**

The Department of Physical and Environmental Sciences at UTSC provides state-of-the-art education in chemistry. Chemistry being an experimental science makes learning in a laboratory setting critical. In order to provide the latest technology to enhance the student learning experience, UTSC will be charging ancillary fees for all chemistry courses that have a laboratory component. Those fees are used to recover the cost of materials and services used during the lab and to maintain and upgrade the equipment used by students. To view a complete list of those fees, students are encouraged to visit the following link:

[http://www.planningandbudget.utoronto.ca/Assets/Academic+Operations+Digital+Assets/Planning+!\\$26+Budget/2012-13+Category+5+Ancillary+Fees.pdf](http://www.planningandbudget.utoronto.ca/Assets/Academic+Operations+Digital+Assets/Planning+!$26+Budget/2012-13+Category+5+Ancillary+Fees.pdf)

***Oral Presentations***

The assignment for the oral presentations will be given to you during lab period. The location and time for your presentations will be posted later on a Blackboard course page. Please check the Blackboard for the detailed explanation about this presentation. Do not worry – historically students do not like the idea about oral presentation at the beginning but really enjoy it at the end.

You will submit your literature assignment through Turnitin program. This is a U of T statement about this program:

**"Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site".**

We will post the detailed explanation of how to use this program later on the course Blackboard page.

***Method of Evaluation:***

The following grading system will be used to calculate your final grade:

| <b>Graded Work</b>       | <b>Value</b> |
|--------------------------|--------------|
| Laboratory*              | 30%          |
| Term Test (NO MAKE-UP)** | 25%          |
| Oral Presentation        | 5%           |
| Final Exam               | 40%          |

\*You must pass the lab to pass the course.

\*\*If you miss a test with a valid reason as described in the section “Policy on Missed Tests”, its value will be added to that of the final.

**Note: To pass the course, you **MUST** pass the laboratory and either the term test or the final exam (and receive a final grade of 50+, of course!).**

***Online Grades:***

Individual grades will be posted on Blackboard as they become available. Please check these periodically to make sure that the posted grades match your own records. Any discrepancy should be reported immediately to the instructor or the lab coordinator, as appropriate.

***Study Hints:***

Organic chemistry is a cumulative subject. As such, an understanding of new material depends on mastery of topics discussed in previous chapters, including that which was taught in Organic Chemistry I and II. **Keep up with the material –do not let yourself get behind!!!**

***Academic Integrity:***

UTSC anticipates that you will pursue your studies with purpose and integrity. The cornerstone of scholarship in all academic disciplines is honesty. UTSC expects that you will approach everything you do here honestly – whether solving a homework problem, or writing an exam. It is critically important both to maintain our community which honours the values of honesty, trust, respect, fairness and responsibility and to protect you, the students within this community, and the value of the degree towards which you are all working so diligently.

According to Section B of the University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) which all students are expected to know and respect, it is an offence for students to:

- To use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.
- To include false, misleading or concocted citations in their work.
- To obtain unauthorized assistance on any assignment.
- To provide unauthorized assistance to another student. This includes showing another student completed work.
- To submit their own work for credit in more than one course without the permission of the instructor.
- To falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.
- To use or possess an unauthorized aid in any test or exam.

There are other offences covered under the Code, but these are by far the most common. Please respect these rules and the values which they protect. Offences against academic integrity will be dealt with according to the procedures outlined in the Code of Behaviour on Academic Matters.

***Accessibility:***

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office ([ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca)) as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff

are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. More details are available at: <http://www.utoronto.ca/~ability/>.

***Lecture Topics (tentative):***

Below is a list of tentative topics to be covered (in the approximate order that you will see them) along with the corresponding text book sections:

1. Chemical bonding and molecular structure
2. Principles of stereochemistry
3. Conformational, steric and stereoelectronic effects
4. Study and description of organic reaction mechanisms
5. Nucleophilic substitution
6. Polar addition and elimination reactions
7. Carbanions and other nucleophilic carbon species
8. Reactions of carbonyl compounds and aromaticity
9. Aromatic substitution
10. Pericyclic reactions
11. Free-radical reactions
12. Photochemistry (optional)