

**UNIVERSITY OF TORONTO**  
**DEPARTMENT OF CHEMISTRY**

**CHM1005HF**

**Spectroscopic Analysis in Organic Chemistry**

**Fall 2019**

**COURSE DESCRIPTION**

This course will discuss the application of spectroscopic methods available to graduate students and researchers, including IR,  $^1\text{H}$  NMR,  $^{13}\text{C}$  NMR, and MS. Practical aspects of each method will be emphasized and students will learn how to operate instruments and interpret data in order to elucidate the structure of complex organic molecules.

**INSTRUCTORS**

**Pjotr Roest**

Instructor (Thursday September 5 - Tuesday October 15) and Lab Coordinator

proest@chem.utoronto.ca

LM371 (Davenport Wing)

Office Hours: Thursdays 11 am - 12 noon in LM364 (Davenport Wing), or by appointment

**Professor M. S. Taylor**

Instructor (Thursday October 17 - Tuesday December 3)

mtaylor@chem.utoronto.ca

LM622

Office Hours: Tuesdays and Thursdays 11 am – 12 noon in LM622, or by appointment

**COURSE INFORMATION**

**Course Times and Locations**

Lecture: Tuesdays and Thursdays 10:00 – 11:00 AM in BL 114 (Bissell Building, 140 St. George St.)

Laboratory: Wednesdays 9:00 AM – 1:00 PM in LM217 or LM121 (only specific days within October - November)

**Course Website**

Important information including course lecture notes, laboratory information and exam information will be posted on the course website on Quercus (<http://q.utoronto.ca>). Please check the course website regularly for announcements and postings.

**Course Materials**

Optional Textbooks: Pavia, *Introduction to Spectroscopy*, 4<sup>th</sup> Ed., Brooks/Cole, 2009

Silverstein, *Spectroscopic Identification of Organic Compounds*, 7<sup>th</sup> Ed., Wiley, 2005.

Articles from the primary research literature and spectra to be interpreted in class may be posted on the course website throughout the semester.

## Outline of Course Material

1. Elemental Analysis and Mass Spectrometry. Elemental analysis and empirical formula. Mass spectrometry techniques and interpretation.
2. Infrared Spectroscopy. Vibrational spectroscopy principles. Characteristic IR frequencies of organic functional groups.
3. NMR spectroscopy I. The NMR experiment.  $^1\text{H}$ ,  $^{13}\text{C}$  and heteronuclear NMR spectroscopy. Coupling constant analysis. Case studies.
4. NMR spectroscopy II. Advanced NMR spectroscopy. Second order coupling and two-dimensional NMR experiments. Case studies.

## Grading Scheme

<i>Course Components</i>	<i>Weight</i>	<i>Due Dates</i>
Assignments (2)	20%	<i>Due:</i> Tuesday October 8 and Tuesday December 3
Computation Laboratory	5%	<i>Lab:</i> Wednesday October 2, <i>Due:</i> Tuesday October 22
Term Test	20%	Tuesday October 15 (10:10-11:10 AM, location TBA)
Unknowns Laboratory	15%	<i>Lab:</i> begins Wednesday October 23, <i>Due:</i> Tuesday November 26
Final Exam	40%	TBA

\**Note:* All assignments and laboratory reports will be submitted as hard copies at the beginning of class. Electronic copies will not be accepted. In most cases, marked materials will be returned the following class.

## Late Policy

Late work will be deducted 10% per day for a maximum of 4 days.

\*Please note: Completed assignments will not be accepted once marked work has been distributed.

## Missed Test Policy

There will be no make-up tests. Please contact Piotr Roest immediately if you miss the term test.

## E-mail Policy

When sending an e-mail, please include the course code CHM1005 in the subject line and use your UTOR e-mail account only. You will normally receive a response within 48 hours. Please keep in mind that lengthy discussions are best approached during office hours.

## Academic Integrity

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Information regarding academic integrity at U of T, and a link to the *Code of Behaviour on Academic Matters*, can be found at [www.artsci.utoronto.ca/osai/students](http://www.artsci.utoronto.ca/osai/students).

## 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 us and/or Accessibility Services at (416) 978 8060; [accessibility.utoronto.ca](http://accessibility.utoronto.ca).