

CHMD16H3: Environmental & Analytical Chemistry

Lecture: Mondays 12-4pm from January 9 – February 13, 2023 in **MW229**

Laboratory: Mondays 12-4pm from Feb 27 – April 3, 2023 in **EV216 (TRACES)**

Course instructor: Professor M.J. Simpson (myrna.simpson@utoronto.ca)

Laboratory teaching assistant:

I. Wrightson (isla.wrightson@mail.utoronto.ca)

COURSE DESCRIPTION

Students will learn about analytical techniques used in environmental chemistry, including: gas and liquid chromatography, mass spectrometry, atomic absorption, and ultraviolet-visible spectroscopy. Environmental sampling and ecotoxicology will also be covered. Students will carry out laboratory analyses and receive hands-on training with analytical instrumentation commonly used in environmental chemistry.

PREREQUISITES

CHMB55H3 and CHMC11H3. All students must have the appropriate prerequisites for this course.

EXCLUSIONS

CHM317H (St. George campus), CHM410H (St. George campus).

GRADE BREAKDOWN (*Due dates are listed on Page 3*)

Midterm exam	30%
Research Project Paper	30%
Laboratory prelab prep & reports	40%

ASSIGNMENT PREPARATION & SUBMISSION

All course work including the Research Project and Laboratory Reports must be prepared using MS Office (or equivalent) software and submitted via Quercus for plagiarism screening and grading.

LATE WORK

Students are expected to submit work on time and late work will not be accepted (and assigned a grade of zero).

LECTURES

There is no required textbook for this course and lecture notes will cover all topics in detail. Lecture notes will be posted on Quercus in advance of the lectures. Students should use the lecture notes as a guide and supplement the lecture slides with their own notes taken during class. Key points will also be emphasized during lecture which will frame the basis of exam materials.

LABORATORY EXPERIMENTS

Students will be divided into small groups and will be provided with detailed protocols for laboratory experiments in advance of the first laboratory. There are two, 3-week long experiments and student groups will carry out these experiments based on a scheduled rotation (to be provided later in the

course). Prior to each 3-week long experiment, students will be required to complete a pre-lab quiz on Quercus (more information will be provided prior to the first laboratory experiment).

LIBRARY RESOURCES

The following textbooks (available online through the UofT library) are relevant to the course content:

- “Environmental Trace Analysis: Techniques and Applications”, 2014, J.R. Dean. Wiley.
- “GC-MS: A practical guide”, 2011, O. D. Sparkman, Z. Penton, F. G. Kitson. 2nd edition, Elsevier.
- “Introduction to Modern Liquid Chromatography”, 2010, L. R. Snyder, J. J. Kirkland, J.W. Dolan. 3rd edition, Wiley.
- “Fundamentals of Contemporary Mass Spectrometry”, 2007, C. Dass, Wiley.
- “Introduction to Mass Spectrometry: Instrumentation, Applications, and Strategies for Data Interpretation”, 2007, J.T. Watson, O. D. Sparkman, 4th edition, Wiley.

PLAGIARISM

Normally, students will be required to submit their course essays to the University’s plagiarism detection tool 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 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>).

University of Toronto Scarborough code of Behavior on Academic Matters states that "it shall be an offense for a student knowingly: to represent as one's own any idea or expression of an idea or work of another in any academic examination or term test or in connection with any other form of academic work, i.e., to commit plagiarism."

Any form of plagiarism will not be tolerated. Students suspected of plagiarism will be reported based on University policy and code of behavior (please refer to the University Calendar for more details).

QUERCUS DISCUSSION BOARD and E-MAIL ENQUIRIES

Course instructors will be available for consultation via office hours, appointment and during lecture/laboratory sessions. Prof. Simpson will hold weekly office hours via Zoom. Office hours and consultation with the teaching assistants will be announced later in the term.

ACCESSIBILITY NEEDS

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible: <http://www.utsc.utoronto.ca/~ability/>.

WRITING SUPPORT

The University of Toronto Scarborough Writing Centre (<http://utsc.utoronto.ca/twc/>) offers writing support to all students in several forms. Students are advised to take advantage of their programs for assistance with scientific writing.

TENTATIVE LECTURE SCHEDULE & LABORATORY SCHEDULE

Date	Topics	Course work due
Monday, January 9	- Course introduction and overview - Sampling and isolation of compounds for quantification and identification	
Monday, January 16	- Basics of analytical measurements and quantification - Gas chromatography & related analytical detectors	
Monday, January 23	- Gas chromatography & related analytical detectors (continued) - Liquid chromatography & related analytical detectors	
Monday, January 30	- Liquid chromatography & related analytical detectors (continued)	
Monday, February 6	- Metal analysis (atomic absorption and atomic emission)	
Monday, February 13	MIDTERM EXAM <i>Details will be announced in class</i>	
Monday, February 20	Family Day Holiday & Reading week – no classes	
Monday, February 27	Laboratory Experiments – round 1 Group 1 – Analysis of PAHs in soil by GC & Pb in soil by AAS Group 2 – Analysis of water by LC & IC	<i>Prelab quiz due before 12pm (see Quercus for more details)</i>
Monday, March 6	Group 1 – Analysis of PAHs in soil by GC & Pb in soil by AAS Group 2 – Analysis of water by LC & IC	<i>Written research paper due before 12 pm (see Quercus for more details)</i>
Monday, March 13	Group 1 – Analysis of PAHs in soil by GC & Pb in soil by AAS Group 2 – Analysis of water by LC & IC	
Monday, March 20	Laboratory Experiments – round 2 Group 1 – Analysis of water by LC & IC Group 2 – Analysis of PAHs in soil by GC & Pb in soil by AAS	<i>Prelab quiz & Lab report due before 12 pm (see Quercus for more details)</i>
Monday, March 27	Group 1 – Analysis of water by LC & IC Group 2 – Analysis of PAHs in soil by GC & Pb in soil by AAS	
Monday, April 3	Group 1 – Analysis of water by LC & IC Group 2 – Analysis of PAHs in soil by GC & Pb in soil by AAS	
Monday, April 10	No laboratory experiments	<i>Lab report due before 5 pm (see Quercus for more details)</i>