**CHMD16H3: Environmental & Analytical Chemistry**

**Lecture:** Mondays 12-4pm from January 8 – February 12, 2024 in **AC334**

**Laboratory:** Mondays 12-4pm from Feb 26 – April 1, 2024 in **EV216 (TRACES)**

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

Laboratory teaching assistants:

I. Wrightson ([isla.wrightson@mail.utoronto.ca](mailto: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%**

***There is no final exam for this course***

**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 who do not submit their work before the listed deadlines for the research paper and laboratory reports will have their grades deducted by **5% for each 24-hour period** past the due date (see due dates on page 3). Students who do not submit the pre-lab quiz before the due date will **receive a grade of zero**. Students requesting accommodations for missed work must complete this form: <https://www.utsc.utoronto.ca/physsci/self-declaration-absence-form-0> and provide documentation. Any student missing the midterm exam will have the grade distribution re-assigned to the research paper evaluation (there will not be any make up exams).

**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. Synder, 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 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."

**QUERCUS DISCUSSION BOARD and E-MAIL ENQUIRIES**

Course instructors will be available for consultation via office hours, appointment and during lecture/laboratory sessions. More information will be provided during the first lecture.

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**

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| **Date** | **Topics** | **Course work due** |
| Monday, January 8 | - Course introduction and overview  - Sampling and isolation of compounds for quantification and identification |  |
| Monday, January 15 | - Basics of analytical measurements and quantification  - Gas chromatography & related analytical detectors |  |
| Monday, January 22 | - Gas chromatography & related analytical detectors (continued)  - Liquid chromatography & related analytical detectors |  |
| Monday, January 29 | - Liquid chromatography & related analytical detectors (continued) |  |
| Monday, February 5 | - Metal analysis (atomic absorption and atomic emission)  - TRACES tour |  |
| Monday, February 12 | **MIDTERM EXAM**  *Written during class time (12pm-2pm)* | |
| Monday, February 19 | ***Family Day Holiday & Reading week – no classes*** | |
| Monday, February 26 | **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 | *Prelab quiz due before 12pm (see Quercus for more details)* |
| Monday, March 4 | Group 1 – Analysis of PAHs in soil by GC & Pb in soil by AAS  Group 2 – Analysis of water by LC & IC | *Written research paper due before 12 pm ( see Quercus for more details)* |
| Monday, March 11 | Group 1 – Analysis of PAHs in soil by GC & Pb in soil by AAS  Group 2 – Analysis of water by LC & IC |  |
| Monday, March 18 | **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 | *Prelab quiz & Lab report due before 12 pm (see Quercus for more details)* |
| Monday, March 25 | Group 1 – Analysis of water by LC & IC  Group 2 – Analysis of PAHs in soil by GC & Pb in soil by AAS |  |
| Monday, April 1 | Group 1 – Analysis of water by LC & IC  Group 2 – Analysis of PAHs in soil by GC & Pb in soil by AAS |  |
| Monday, April 8\* | ***No laboratory experiments*** | *Lab report due before 5 pm (see Quercus for more details)* |

*\*Last day to submit term work allowed by the University (no extensions can be provided).*