ENV H 432

Chemical Sampling & Analysis

5 Credits, Graded

Spring 2019
Lab: Mon & Weds, HSB T568 8:30-11:30am
Lecture: Mon, HSB T360 2:30-3:20pm

Instructor: Chris Simpson
Email: simpson1@uw.edu
Phone: 206-543-3222
Office: HSB F225B
Office Hours: by appointment
TA: Brianne Duncan
Max Chmielinski
Office Hours: by appointment

Course Overview & Format

This class gives students a background and some familiarity with measurement for environmental assessment. The focus of the course is detection, sampling, and analysis of chemical hazards in different samples from occupational or environmental settings. This is an introductory course, potentially leading to more specific courses on sampling and analysis of air, water, wastewater, marine samples, soils, and occupational hazards.

Prerequisites

General Chemistry.

Learning Objectives

By the end of this course, students will demonstrate the ability to:

1. Identify literature sources of standard methods for environmental and occupational assessment of chemical contaminants, and provide a framework for method selection.
2. Develop and apply a sampling strategy to adequately characterize chemical contaminants in air, water, and solid environmental media.
3. Describe basic concepts in quality control and quality assurance for chemical measurement data.
4. Critically evaluate the reliability of chemical measurement data.
5. Develop analysis plans for measurements of four different chemical contaminants in environmental and occupational samples. Your analysis plans will include selection of appropriate analytical methods and design of appropriate experimental procedures to ensure reliable data
6. Recognize the operating principles, advantages and limitations of several kinds of currently-used semi-quantitative field indicators. Demonstrate proficiency in the use of these devices.
7. Recognize the operating principles, advantages and limitations of several kinds of currently-used field meters for chemical agents. Demonstrate proficiency in the use of these devices.

8. Demonstrate knowledge of the operating principles, advantages and limitations of several kinds of laboratory instruments used for chemical analysis, including: FTIR, UV/visible absorption spectrometers, gas chromatographs, and atomic absorption spectrometers. Demonstrate proficiency in the operation of these devices.
9. Demonstrate the ability to work effectively and co-operatively as part of a team.
10. Demonstrate competency in technical writing.
11. Describe health hazards associated with at least four important chemical agents found in environmental and occupational settings, and hazards associated with the analytical procedures used to measure those contaminants.

Textbooks & Readings

There is no required text for this course, however the following texts are recommended:

- *Quantitative Chemical Analysis*, 7th, 8th or 9th edition, by Daniel C. Harris. On reserve in the Health Sciences Library and HSB F226.
- *Fundamentals of Environmental Sampling and Analysis* by Chunlong Zhang, Hoboken, N.J: Wiley-Interscience, 2007, available as eBook through UW Libraries.

Course Website

All materials, assignments, etc. for this course will be available through the Canvas course website (https://canvas.uw.edu/courses/1200098/pages/front-page).

Student Assessment

The overall course grade will be based on:

10%	Pre-labs
50%	Lab Reports
10%	Class participation
30%	Final exam

Pre-labs (10%): Pre-labs are designed to prepare students for conducting the laboratory experiments. Pre-lab quiz questions will be emailed to students by the Friday prior to starting each lab module. Most questions can be answered by reading the lab or lecture materials, or additional resources posted on the lab Module of the course website.

Lab Reports (50%): Each lab group prepares a report and receives a collective grade for each of the lab modules. Specific roles and responsibilities are outlined in the "Round-robin" handout. Each of the four lab reports counts as 12.5% of the total grade. Note that lab reports are substantial documents, typically 10-20 pages in length and require substantial out-of-class time commitment to summarize, process, interpret and report your experimental findings. Students are expected to reference all work and give appropriate attribution for all materials cited, including any reference to websites or articles.

Participation (10%): Students are graded individually on class and laboratory session participation. Ways to earn these points include asking questions in class, actively contributing to laboratory sessions and promoting teamwork in lab groups. **Please notify the course instructor or TA, if you will not be able to attend a class.** Keep in mind that, every time you are late or absent, you place a burden on your team members to fulfill your assigned role.

Common Courtesy: Part of the quality of your participation is your being responsible for managing your workspace and materials. That means cleaning up after yourself, labeling all materials you will leave in the lab between sessions, and cooperating with classmates in sharing the lab resources including bench space. Untidy, unsafe, or disruptive behavior will be noted and will affect your final "Participation" score.

Final Exam (30%): Students are graded individually on completion of an in-class final exam. This is a closed-book and closed-note exam. Students must bring a calculator (no cell phones). The exam is composed of matching, multiple choice, story problems with calculations, and essay questions. The essay question does not change from year to year. A practice exam is posted on the course website.

Use of Electronic Devices in Class

We expect students attending class to give their full attention to class activities; so please, no use of computers or cell phones (including texting) during class, unless needed for data analysis in lab sessions. Thank you!

Accessing TAs for Help

We recommend using the Canvas Discussion Board for questions about assignments or concepts from lecture or assigned readings (first thing to try). The TAs will be tracking the board and will provide input as needed. You are welcome to ask TAs for help during lab sessions (second thing to try), but if a need arises for more one-on-one help, you can make an appointment with one of the TAs (third thing to try), either in person during class or by email. TA email links are on the Canvas course home page.

Course Organization

Refer to the Schedule below and on the Canvas course site. The course consists of lectures every Monday and lab sessions Tuesday and Thursday. The first lab session is devoted to basic techniques that will be used later in the course: preparation of standards, calibration of equipment. The remainder of the course is comprised of four lab modules: air, water, solid media, and airborne particles. Teams of approximately four students will carry out each module, which typically includes a lab preparation session, a field sampling day, a sample prep session and a lab measurement session.

Class assignments that are turned in for grading include pre-lab quizzes and the written reports for each lab module or experiment (as specified in each module description). However, this is intended to be a hands-on course and requires preparation in the form of collecting information,

planning activities, calculating standard amounts or sampling times, and each student is accountable to their team members to have done the needed preparation prior to class.

WEEK 1	**Introduction & Overview**
Session 1	Course introduction and overview (lecture)
Session 2	Overview of round robin roles & lab reports (lecture), lab safety and chlorine lab
Session 3	Lab safety and chlorine lab (cont.)
WEEK 2	**Quality Assurance / Quality Control**
Session 4	QA/QC Lecture
Session 5	Lab 1, Day 1 (Pre-lab 1 due)
Session 6	Lab 1, Day 2
WEEK 3	**Air Contaminants - Aerosols**
Session 7	Air Contaminants – Aerosols Lecture
Session 8	Lab 1, Day 3
Session 9	Lab 1, Day 4
WEEK 4	**Air Contaminants – Gases & Vapors**
Session 10	Air Contaminants – Gases & Vapors Lecture
Session 11	Lab 2, Day 1 (Pre-lab 2 due)
Session 12	Lab 2, Day 2 (Lab report 1 due)
WEEK 5	**Soil Sampling Techniques**
Session 13	Soil Sampling Techniques Lecture
Session 14	Lab 2, Day 3
Session 15	Lab 2, Day 4
WEEK 6	**Chromatography**
Session 16	Chromatography Lecture
Session 17	Lab 3, Day 1 (Pre-lab 3 due)
Session 18	Lab 3, Day 2 (Lab report 2 due)
WEEK 7	**Spectroscopy – Basic Principles**
Session 19	Spectroscopy – Basic Principles Lecture
Session 20	Lab 3, Day 3
Session 21	Lab 3, Day 4
WEEK 8	**Spectroscopy - Applications**
Session 22	Spectroscopy – Applications Lecture

Session 23	Lab 4, Day 1 (Pre-lab 4 due)
Session 24	Lab 4, Day 2 (Lab report 3 due)
WEEK 9	**Mass Spectrometry**
Session 25	Mass Spectrometry Lecture
Session 26	Lab 4, Day 3
Session 27	Lab 4, Day 4
WEEK 10	**Review & Exam**
Session 28	Final exam review session 1
Session 29	Final exam review session 2
Session 30	Final exam (Lab report 4 due)

Access and Accommodations

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

UW Academic Integrity Statement

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

Multi-Cultural Inclusion Statement

The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. DCinfo@uw.edu is also a resource for students with classroom climate concerns.