ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON | SCHOOL OF PUBLIC HEALTH
(https://deohs.washington.edu/)

Quarter: Spring 2025
Credits & Grading: 3 credits, graded
Time: Mondays & Wednesdays, 8:30 to 12:20 PM
Location: HSB T-568-574

Instructors:

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Illness Protocols and Safety

If you feel ill or exhibit respiratory or other symptoms, you should not come to class. Seek medical attention if necessary and notify your instructor(s) as soon as possible by email. UW Environmental Health & Safety recommends that you wear a well fitting mask while you are symptomatic.

Additional recommendations include getting your **annual flu shot** (https://wellbeing.uw.edu/flu-vaccination/) and getting boosted with the updated COVID vaccines (available **at clinics and pharmacies, as well as through UW Medicine** (https://www.washington.edu/coronavirus/vaccines) and local health agencies).

Please check your email and CANVAS announcements daily BEFORE coming to class. If we need to conduct class remotely because the instructor or a guest speaker is unable to attend in person, we

will send all registered students an email and/or post a CANVAS announcement with a Zoom link for remote instruction or a plan for making up the class.

SPH Land Acknowledgment

The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

Course Description

This laboratory-based course covers the detection, sampling and analysis techniques for measuring contaminant concentrations and exposures in occupational settings and the ambient environment. The course emphasizes sampling and measurement techniques primarily for airborne exposures to particulate matter and chemical agents, and provide hands-on experience with a variety of common direct reading instruments, and integrated sampling devices followed by subsequent off-line chemical analysis. The laboratory experiments are intended to simulate typical workplace and environmental measurement situations and to provide a basis for the selection of sampling and analytical techniques and for the critical evaluation of the laboratory results.

In compliance with State of Washington health and safety regulations, No food or drinks are allowed in the classroom.

Absence from Class

Students are expected to attend class and to participate in all laboratory sessions and graded activities. It is not possible to make up for missed lab sessions. If a student shows up to a lab or lecture session more than 15 minutes late or doesn't come to the lab session at all it will be considered an unexcused absence. Two unexcused absences will result in reduction of the final grade by one full letter. Three unexcused absences will result in the student be dropped form the course and receiving a grade of 0.0.

Content

- Calibration of airflow measuring devices
- Aerosol sampling using filter samplers, cyclones and cascade impactors. Aerosol analysis using gravimetric and real-time methods.
- Direct measurement techniques for gases and vapors: Detector tubes and direct reading instruments.

- Infra red spectroscopy: non-dispersive carbon dioxide monitor and the dispersive MIRAN instrument for the measurement of single compounds and the evaluation of mixtures in air.
- Adsorption sampling for organic gases using charcoal tube and badge samplers and analysis by gas chromatography.
- Sampling for ultrafine PM and Black Carbon using direct reading instruments.
- Atomic absorption and x-ray fluorescence spectroscopies for analysis of metals in airborne particles and surface samples.

Course Learning objectives

At the end of this course, students should be able to accomplish the following:

1. Identify literature sources of standard methods for measurement of occupational exposures to chemical contaminants
2. Identify the advantages and the limitations inherent in a variety of techniques and instruments used for industrial hygiene measurements, and what specific factors in the sampling situation might prevent accurate application of that approach.
3. Describe a framework for selection of appropriate methods for measurements of specific workplace contaminants.
4. Demonstrate knowledge of the operating principles of several kinds of contemporary field meters for chemical agents. Demonstrate proficiency in the use of these devices.
5. Demonstrate knowledge of the operating principles, advantages and limitations of several kinds of major laboratory instruments commonly used for chemical analysis, including: FTIR, UV/visible absorption spectrometers, gas chromatographs, atomic absorption spectrometers. Demonstrate proficiency in the operation of these devices.
6. Apply basic concepts in quality control and quality assurance for chemical measurement data.
7. Critically evaluate the reliability of chemical measurement data.
8. Express and interpret the chemical measurement results in terms that are applicable to occupational or environmental standards and situations.
9. Demonstrate competency in technical writing.
10. Demonstrate the ability to work effectively, co-operatively, and safely as part of a team.

Responsibilities

The student responsibilities for the course are the following:

1. Prepare in advance of each lab period. Read/understand each experiment and assigned readings before class. Complete all necessary calculations for adequate sampling times, for preparation of standard solutions, and for dilution schemes to provide appropriate concentrations.
2. Complete lab assignments for each experiment. Assignments are due before the following week's lab starts unless otherwise announced.

3. Complete one lab report due at the end of the course.

You will work in small groups for most of the experiments. However, each student is responsible for taking part in all phases of each experiment and for preparing and submitting assignments and lab report.

Class organization

Refer to the class schedule. The course consists of laboratory sessions twice a week.

Grading

80% will be based on assignments, each of which will be weighted equally.

- There is one laboratory safety assignment.
- There are seven lab assignments where students will answer questions in lab guides. For each lab assignment, up to half of the points are awarded for active and effective participation in the hands-on component of the experiment. To achieve full marks on this section students would: (i) prepare for the experiment in advance of the lab by reading the lab guide and associated materials prior to class; (ii) complete any required pre-lab calculations, (iii) arrive on-time for the lab, (iv) actively participate in the hands-on activities, (v) work effectively with your team members, and (vi) take on leadership roles within the team, as appropriate.

20% will be based on a final lab report (details below).

Guidelines for Preparation of Lab Reports

All students will be required to submit an individual lab report for one lab. Students may choose which lab to write a report on from weeks 3-8 (in other words, excluding week 2 lab on pumps). Students are expected to actively participate in all aspects of generating the data in the laboratory to better learn and understand all of the principles and procedures. This is essential in order to be able to independently carry out such surveys and write reports in the future.

In general, lab reports should follow this outline:

Experimental Objectives - In one paragraph, state the major aims of the lab.

Methods - List the citation for the methods and/or references used, serial numbers of the equipment utilized, and any procedural modifications. Do not re-write the guide. Also provide the calculations and the schemes for standards preparation and dilutions. Reviewers cannot help troubleshoot errors without verification of standards and any questionable data. **The Objectives and Methods sections typically should not exceed 2 pages combined.**

Results - Provide all sample data, standards data, and regression data with appropriate curves. Show precision of replicates and coefficient of variation for the method. Also give worked examples of all your calculations, equations and formulas, especially when serial calculations are calculated by spreadsheet. Listing numeric results of calculations, without showing the equation used to arrive at the result, will be deducted points on the assignment. Copies of computer printouts or integrator data plots, should be accompanied by a listing of the formulas, constants and factors. If you are not familiar with appropriate numbers of significant digits when reporting numbers, please read this: **Significant Figures.pdf. (https://canvas.uw.edu/courses/1800771/files/132132718/download?wrap=1)**

Discussion - Compare your observed vs. expected results where appropriate. Include any information of variables, which might have spuriously affected your results. Comment on why the reasons your results may differ from theoretical. Address recovery problems, analytical errors, and uncertainties.

Conclusions - The conclusion section of the reports should provide not only your evaluation of the method and the validity of your data, but should also address the relation of the measured levels of contaminants to those of standards such as TLVs or PELs. The optimum length of the Discussion and Conclusion Sections should be but is not limited to 1 page each. Provide summary tables of all major results.

Questions - Specific questions included in the lab guide were answered in the assignment for that lab and do not need to be explicitly addressed for the report, unless appropriate for writing methods, results, discussion, and conclusion sections described above.

Grading - Reports will be graded on the accuracy and precision of the results, the application of the techniques, the validity of the conclusions, the investigation and explanations of errors. Reports should be typed or word processed, and must be neat, legible and organized. Grades can be adversely affected by data that cannot be readily found and/or recognized because of poor organization of the report.

Textbook and Readings

Refer to the **Modules (https://canvas.uw.edu/courses/1800771/modules)** page for specific readings for each of the labs

Textbook and Readings

Refer to the **Week 1 module (https://canvas.uw.edu/courses/1800771/modules)** page for information about lab safety

SCHEDULE

See the **Syllabus (https://canvas.uw.edu/courses/1800771/assignments/syllabus)** for calendar of labs and assignments.

See the **Modules** (https://canvas.uw.edu/courses/1800771/modules) for each week's lab instructions.

Access & Accommodations

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented 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), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at disability.uw.edu.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at **Religious Accommodations Policy** (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy) Accommodations must be requested within the first two weeks of this course using the **Religious Accommodations Request** (https://registrar.washington.edu/students/religious-accommodations-request) form (https://registrar.washington.edu/students/religious-accommodations-request) .

Academic Integrity

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** (https://www.washington.edu/studentconduct) (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and **the SPH Academic Integrity Policy** (https://sph.washington.edu/students/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.