

ENV H 553 A Wi 17: Environmental Exposure Monitoring Methods

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ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH · UNIVERSITY *of* WASHINGTON

ENV H 553 A: Environmental Exposure Monitoring Methods - Winter 2016

4 credits, graded, SLN 14513

Instructor:

Christopher D Simpson, Professor & Academic Degree Leader

DEOHS

Health Sciences Building F-225B

(206) 543-3222

simpson1@uw.edu

Office hours by appointment

Time: Mondays + Wednesdays at 12:30p - 1:20p and Friday 11:30a - 1:20p

Location: Health Sciences Building T498 (Mondays & Wednesdays) and E216 (Friday)

Brief Description:

A key element in maintaining a healthy human environment is Exposure Monitoring for contaminants. This course will emphasize developing a thorough understanding of the principles and methods for determining the intensity of exposure to contaminants in air and on surfaces, in food and drinking water, and for measurement of exposure markers in human specimens. In addition, procedures for interpretation and application of results will be explored, in the context of making decisions regarding the hazard magnitude and choice of methods for control.

Course Objectives:

At the end of the course, students should be able:

1. To describe the strategy and rationale for environmental sampling and exposure monitoring, including the selection of appropriate sampling methods.
2. To demonstrate the application of principles and techniques for sampling air and contaminated surfaces, food, drinking water, and human specimens to exposure monitoring.
3. To choose and explain the proper chemical and physical analytical methods to be applied to these samples.
4. To implement standard methods of validation and evaluation to determine the strengths and limitations of each sampling and analytical method, and to decide whether results are sensible within those limitations.
5. To identify and describe the standard published references in environmental sampling and analysis for assessment of human exposure.

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Course Texts:

Zhang, C. Fundamentals of Environmental Sampling and Analysis. Hoboken, NJ: John Wiley & Sons, 2007.

Electronic access to this text:

<http://washington.ebib.com/patron/FullRecord.aspx?p=287305> (<http://washington.ebib.com/patron/FullRecord.aspx?p=287305>)

Ramachandran, G. Occupational Exposure Assessment for Air Contaminants. Boca Raton, FL: Taylor & Francis, 2005.

<http://washington.ebib.com.offcampus.lib.washington.edu/patron/FullRecord.aspx?p=264072>
(<http://washington.ebib.com.offcampus.lib.washington.edu/patron/FullRecord.aspx?p=264072>)

Supplemental References:

Artiola JF, et al, Eds. Environmental Monitoring and Characterization. Amsterdam: Elsevier Academic Press, 2004. <http://www.eng.uerj.br/~fariasol/disciplinas/Monitoramento%20Ambiental.old/Environmental%20Monitoring%20and%20Characterization.pdf>
(<http://www.eng.uerj.br/~fariasol/disciplinas/Monitoramento%20Ambiental.old/Environmental%20Monitoring%20and%20Characterization.pdf>)

Clesceri LS, Greenberg AE, Eaton AD, eds. Standard Methods for the Examination of Water and Wastewater, 20th Edition. Washington, DC: APHA, AWWA, and the Water Environment Federation, 1998. http://www.mwa.co.th/download/file_upload/SMWW_1000-3000.pdf
(http://www.mwa.co.th/download/file_upload/SMWW_1000-3000.pdf)

Gilbert RO. Statistical Methods for Environmental Pollution Monitoring. New York: John Wiley & Sons, 1987. http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/205.pdf
(http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/205.pdf)

Harris DC. Quantitative Chemical Analysis, 8th Ed. New York: W.H. Freeman, 2010. http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/205.pdf
(http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/303d_policydocs/205.pdf)

Keith LH, ed. Principles of Environmental Sampling, Second Edition. Washington, DC: American Chemical Society, 1996.

Leidel NA, Busch KA, Lynch JR. Occupational Exposure Sampling Strategy Manual. Cincinnati, OH: National Institute for Occupational Safety and Health, 1977. <https://www.cdc.gov/niosh/docs/77-173/pdfs/77-173.pdf> (<https://www.cdc.gov/niosh/docs/77-173/pdfs/77-173.pdf>)

Lippmann M, Cohen BS, Schlesinger RB. Environmental Health Science: Recognition, Evaluation and Control of Chemical and Physical Health Hazards. New York: Oxford University Press, 2003.

McDermott HJ. Air Monitoring for Toxic Exposures. Second Ed. New York: Wiley Interscience, 2004. <http://uwashington.worldcat.org/title/air-monitoring-for-toxicexposures/oclc/56733897/viewport> (<http://uwashington.worldcat.org/title/air-monitoring-for-toxicexposures/oclc/56733897/viewport>)

National Research Council. Exposure Science in the 21st Century: A Vision and a Strategy. Washington, DC: National Academy Press, 2012. <https://www.nap.edu/read/13507/chapter/1> (<https://www.nap.edu/read/13507/chapter/1>)

Course Requirements:

1. Reading assignments and class participation: Students should read the assignments prior to the scheduled class and be familiar with the background for each topic scheduled. Reading assignments will come from the required texts and provided handouts.
2. Homework problems: Problem sets will be assigned, generally weekly, and are to be completed by each student independently except where specific instructions to the contrary are provided. Homework will be graded and returned in a timely fashion.
3. Examinations: Two mid-term quizzes will be given during class on the dates indicated in the course schedule. Each of these will address material covered since the previous quiz. The final examination is scheduled during examination week, and will be cumulative in its coverage.

Basis for Grading:

The final grade will be determined as the weighted mean of scores on the homework and exams. The weighting factors are:

Homework	40%
Mid Term Quizzes	15% each
Final Exam	30%

Students with Disabilities:

Access and Accommodation

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](tel:206-543-8924) or uwdrs@uw.edu (mailto:uwdrs@uw.edu) or disability.uw.edu (<http://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.




















Academic Integrity <http://sph.washington.edu/students/academicintegrity/> (<http://sph.washington.edu/students/academicintegrity/>)





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.

Course Summary:

Date	Details	
Wed Jan 4, 2017	 ENVH553A - Lecture 1 - Introduction; Role of Exposure Assessment in Risk Assessment and Risk Management (https://canvas.uw.edu/calendar?event_id=971248&include_contexts=course_1099263)	12:30pm to 1:20pm
	 ENVH553A - Lecture 2 - Elements of Exposure Assessment: Concentration, Intake Rate, Deposition & Uptake Fraction (https://canvas.uw.edu/calendar?)	11:30am to 12:20pm

Fri Jan 6, 2017	event_id=971247&include_contexts=course_1099263	
	 ENVH553A - Lecture 3 - Characteristics of Contaminant Concentration: volume fraction, mass fraction, mass/volume, units (https://canvas.uw.edu/calendar?event_id=971249&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Jan 9, 2017	 ENVH553A - Lecture 4 - Characteristics of Particles: Size and Size Distributions (https://canvas.uw.edu/calendar?event_id=971256&include_contexts=course_1099263)	12:30pm to 1:20pm
Wed Jan 11, 2017	 ENVH553A - Lecture 5 - Characteristics of Particles, continued (https://canvas.uw.edu/calendar?event_id=971251&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Jan 13, 2017	 ENVH553A - Lecture 6 - Contaminant Properties: Phase Equilibrium (https://canvas.uw.edu/calendar?event_id=971250&include_contexts=course_1099263)	11:30am to 12:20pm
	 ENVH553A - Lecture 7 - Contaminant Properties: Phase equilibria (cont)., and Interphase transport (https://canvas.uw.edu/calendar?event_id=971252&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Jan 16, 2017	 UW HOLIDAY (https://canvas.uw.edu/calendar?event_id=971273&include_contexts=course_1099263)	12am
Tue Jan 17, 2017	 Problem Set #1 (https://canvas.uw.edu/courses/1099263/assignments/3553683)	due by 11:59pm
Wed Jan 18, 2017	 ENVH553A - Lecture 8 - Contaminant Properties: Interphase transport, part 2 (https://canvas.uw.edu/calendar?event_id=971274&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Jan 20, 2017	 ENVH553A - Lecture 9: Interaction with Electromagnetic radiation (https://canvas.uw.edu/calendar?event_id=971257&include_contexts=course_1099263)	11:30am to 12:20pm
	 ENVH553A - Lecture 10 - Contaminant Properties: density, viscosity, dielectric strength, polarity (https://canvas.uw.edu/calendar?event_id=971254&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Jan 23, 2017	 ENVH553A - Lecture 11 Compartment Properties: Volume and Flow Rate (Part 1) (https://canvas.uw.edu/calendar?event_id=971272&include_contexts=course_1099263)	12:30pm to 1:20pm
Wed Jan 25, 2017	 ENVH553A Lecture 12 Compartment properties: Volume and FLOW rate (part 2) (https://canvas.uw.edu/calendar?event_id=971271&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Jan 27, 2017	 ENVH553A Lecture #13 Sampling methods: Integrating versus Continuous; Extractive vs in situ (https://canvas.uw.edu/calendar?event_id=971270&include_contexts=course_1099263)	11:30am to 12:20pm
	 ENVH553A Lecture 14 Particle methods: Particle motion in air (https://canvas.uw.edu/calendar?event_id=971245&include_contexts=course_1099263)	12:30pm to 1:20pm
Sun Jan 29, 2017	 Problem Set #2 (https://canvas.uw.edu/courses/1099263/assignments/3548565)	due by 11:59pm
Mon Jan 30, 2017	 study session (https://canvas.uw.edu/calendar?event_id=971246&include_contexts=course_1099263)	12:30pm to 1:30pm
Wed Feb 1, 2017	 ENVH553A: Quiz #1 (https://canvas.uw.edu/calendar?event_id=971269&include_contexts=course_1099263)	12:30pm to 1:20pm
	 in-class Quiz #1 (https://canvas.uw.edu/courses/1099263/assignments/3548562)	due by 11:59pm
	 ENVH553A Lecture #15 Particle methods: Filtration	11:30am to 12:20pm


Fri Feb 3, 2017	https://canvas.uw.edu/calendar?event_id=971253&include_contexts=course_1099263	
	 ENVH553A: L#16 Particle methods: Impaction (https://canvas.uw.edu/calendar?event_id=971244&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Feb 6, 2017	 ENVH553A: Lecture #17 Particle methods - Optical, Electric, Diffusive (https://canvas.uw.edu/calendar?event_id=971268&include_contexts=course_1099263)	12:30pm to 1:20pm
	 Problem Set #3 (https://canvas.uw.edu/courses/1099263/assignments/3548566)	due by 11:59pm
Wed Feb 8, 2017	 ENVH553A: Lecture # 18 Monitoring nanoparticles (https://canvas.uw.edu/calendar?event_id=971243&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Feb 10, 2017	 ENVH553A: Lecture #19: gas methods - Absorption & diffusive samplers (https://canvas.uw.edu/calendar?event_id=971242&include_contexts=course_1099263)	11:30am to 12:20pm
	 ENVH553A: Lecture # 20 Gas Methods: Adsorption and Diffusion (https://canvas.uw.edu/calendar?event_id=971267&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Feb 13, 2017	 ENVH553A: Lecture # 21 Gas Methods - Optical/Spectroscopy (https://canvas.uw.edu/calendar?event_id=971259&include_contexts=course_1099263)	12:30pm to 1:20pm
	 Problem Set #4 (https://canvas.uw.edu/courses/1099263/assignments/3548567)	due by 11:59pm
Wed Feb 15, 2017	 ENVH553A Lecture #22: Gas Methods - Electrochemical (https://canvas.uw.edu/calendar?event_id=971258&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Feb 17, 2017	 ENVH553A: Lecture #23: Particles in water (https://canvas.uw.edu/calendar?event_id=971265&include_contexts=course_1099263)	11:30am to 1:20pm
	 ENVH553A - Lecture #24 - Biomarker methods (https://canvas.uw.edu/calendar?event_id=972768&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Feb 20, 2017	 UW HOLIDAY (https://canvas.uw.edu/calendar?event_id=971266&include_contexts=course_1099263)	12am
Wed Feb 22, 2017	 ENVH553A: Lecture #25: Chromatography I (https://canvas.uw.edu/calendar?event_id=971262&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Feb 24, 2017	 Lecture #26: Chromatography II (https://canvas.uw.edu/calendar?event_id=971240&include_contexts=course_1099263)	11:30am to 12:20pm
	 study session (https://canvas.uw.edu/calendar?event_id=971241&include_contexts=course_1099263)	12:30pm to 1:20pm
Mon Feb 27, 2017	 ENVH553A: Quiz #2 (https://canvas.uw.edu/calendar?event_id=971264&include_contexts=course_1099263)	12:30pm to 1:20pm
	 in-class quiz #2 (https://canvas.uw.edu/courses/1099263/assignments/3548563)	due by 12:30pm
Wed Mar 1, 2017	 ENVH553A: Lecture #27: Mass spectrometry (https://canvas.uw.edu/calendar?event_id=971239&include_contexts=course_1099263)	12:30pm to 1:20pm
Fri Mar 3, 2017	 ENVH553A: Lecture #28: Sampling and analysis methods for microbiological agents (https://canvas.uw.edu/calendar?event_id=971255&include_contexts=course_1099263)	11:30am to 1:20pm
	 Lecture #29: Microbiological sampling and analysis (cont.) (https://canvas.uw.edu/calendar?event_id=972773&include_contexts=course_1099263)	12:30pm to 1:20pm

Mon Mar 6, 2017

 [ENVH553A: lecture #30: Mass spectrometry cont. \(https://canvas.uw.edu/calendar?event_id=971261&include_contexts=course_1099263\)](https://canvas.uw.edu/calendar?event_id=971261&include_contexts=course_1099263) 12:30pm to 1:20pm

 [Problem Set #5 \(https://canvas.uw.edu/courses/1099263/assignments/3548568\)](https://canvas.uw.edu/courses/1099263/assignments/3548568) due by 11:59pm

Wed Mar 8, 2017

 [ENVH553A: Lecture #31 Data Quality \(https://canvas.uw.edu/calendar?event_id=971263&include_contexts=course_1099263\)](https://canvas.uw.edu/calendar?event_id=971263&include_contexts=course_1099263) 12:30pm to 1:20pm

Fri Mar 10, 2017


 [ENVH553A: Lecture #32: Sampling of surfaces \(https://canvas.uw.edu/calendar?event_id=971260&include_contexts=course_1099263\)](https://canvas.uw.edu/calendar?event_id=971260&include_contexts=course_1099263) 11:30am to 12:20pm

 [ENVH553A: Study session \(https://canvas.uw.edu/calendar?event_id=971238&include_contexts=course_1099263\)](https://canvas.uw.edu/calendar?event_id=971238&include_contexts=course_1099263) 12:30pm to 1:20pm

Thu Mar 16, 2017

 [Final exam \(https://canvas.uw.edu/courses/1099263/assignments/3548561\)](https://canvas.uw.edu/courses/1099263/assignments/3548561) due by 8:30am

Fri Mar 17, 2017

 [UW Winter Quarter END \(https://canvas.uw.edu/calendar?event_id=971275&include_contexts=course_1099263\)](https://canvas.uw.edu/calendar?event_id=971275&include_contexts=course_1099263) 1am
