THE OHIO STATE UNIVERSITY
COLLEGE OF PUBLIC HEALTH

PUBHEHS 7380 – Exposure Science Monitoring Techniques I
3 credits – Autumn 2025
Weekly Asynchronous Online Lectures + In-Person Laboratory Sessions on Fridays at 12:30 pm – 3:30 pm at 430 Cunz Hall.

Course Instructor

Ahmad El Hellani, PhD, Chemistry, Université Paris Sud-France, Date of Degree (2012)
424 Cunz Hall
Tel: (614)-247-4438
Email: elhellani.1@osu.edu

Molly Mills, PhD, Environmental Science, The Ohio State University, 2022
400B Cunz Hall
Tel: (614)-247-0853
Email: mills.650@osu.edu

Instructor's Office Hours

Dr. El Hellani: Fridays 10:00 am – 11:00 am (In-person), or by appointment
Dr. Mills: Mondays noon-1 PM (In-person), or by appointment

Faculty Feedback & Response Time:

The following gives you an idea of my intended availability during the course:

- **Grading:** You can generally expect feedback on assignments within 7 days.
- **E-mail:** I will reply to e-mails (sent via Carmen) within 24 hours on school days.
- **Discussion board:** Either the TA or the instructor will check and reply to messages in the discussion boards at least every 12 hours on school days, and every 24 hours on weekends, unless a different turnaround time (due to travel, etc.) is announced.

Graduate Teaching Assistant (GTA)

Not assigned yet.

GTA Responsibilities

The GTA assigned to the course will hold regular office hours and lead review sessions for any students who need help with class material. The TA may assist with scoring assignments; however, final grades will be assigned by the professor. **Any questions regarding grading should be directed to the professor and not the TA.**

Course Description

Environmental health science (EHS) is a multidisciplinary profession focusing mainly on public (human) health issues related to food/water/beverage sanitation, and water, air, and land (soil) contamination and pollution. As a sub-discipline of EHS, Exposure Science is focused on the identification and characterization of the contact of humans (and other organisms) with contaminants in these environmental matrices, and the uptake of such into the body. The Exposure Science Monitoring Techniques I course will discuss the principles and practices of human exposure sampling of contaminants in environmental and biological matrices, with special emphasis on the air and water matrices. In addition, students will be introduced to analytical techniques and instrumentation for chemical analysis in the course.

Lectures, video viewings, readings, and laboratories will focus on field sampling, laboratory analytical instrumentation, and methods. Accordingly, students will be introduced to both theoretical and practical aspects via pre-recorded or classroom lectures, laboratory demonstrations, required readings, assignments, and self-directed group projects.

An inherent goal of the course is to familiarize students with the relevance and application of sampling and analytical techniques for characterizing the type and magnitude of environmental contamination. The role of exposure monitoring in the assessment of human exposure to environmental agents, exposure regulation, and prevention and control will be discussed in lectures and emphasized in class/laboratory activities. The importance and application of the tools of exposure science to the public health-related disciplines of epidemiology and environmental and human health risk assessment will also be highlighted.

The content of the course necessarily reinforces the Environmental Health Science (EHS) model (Figure). The characterization of exposure to toxic agents is a necessary step for quantifying the risk of resulting adverse effects in human receptors. The conduct of exposure science requires a comprehensive knowledge of the nature of toxic agents, the pathways resulting in contact with human (and other biological) receptors, and factors that mediate exposure. Exposure Science also informs the practice of risk assessment and the development of effective policies and controls to protect individuals against environmental contaminants. Consequently, the conduct of risk assessment requires knowledge of the exposure continuum from source to receptor, and it is an integral part of the societal response to address exposures to environmental contaminants.

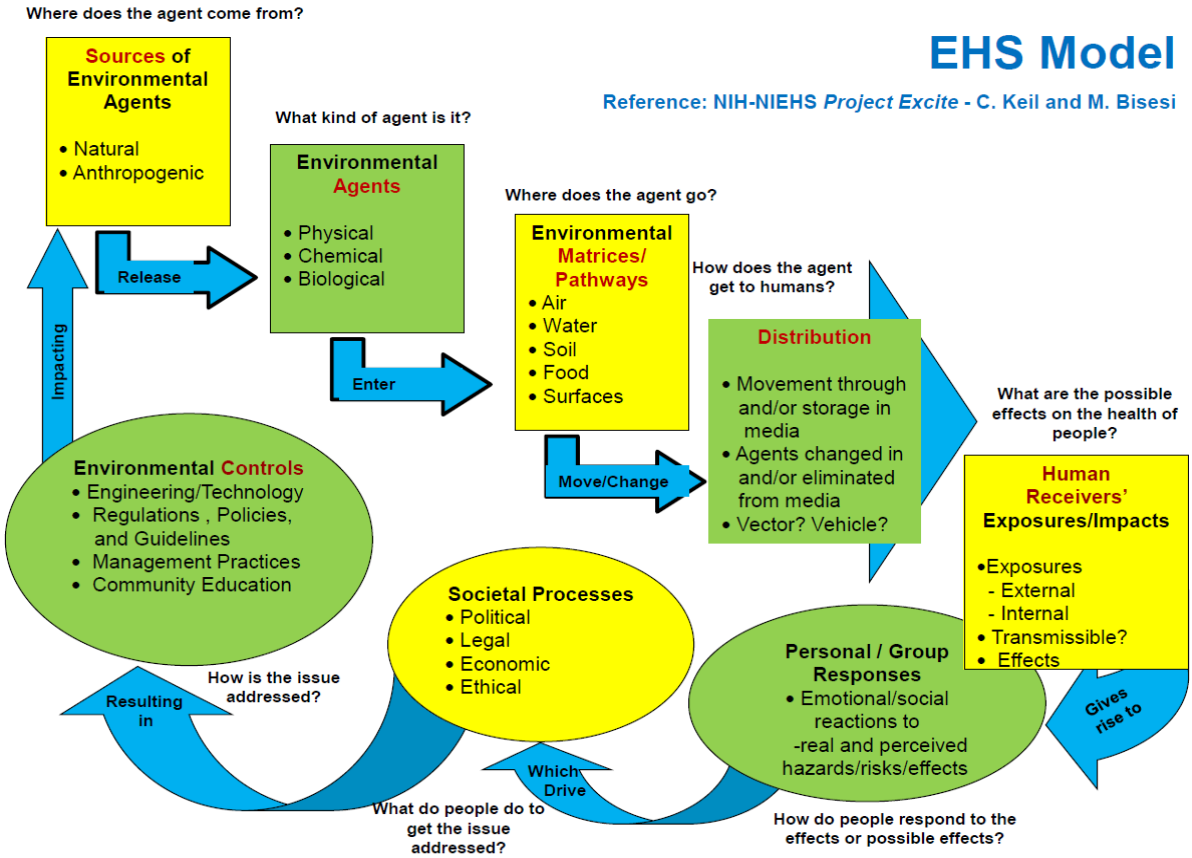

Figure. EHS model: components of the EHS model either inform or are informed by the risk assessment process.

Prerequisites
None

Course Learning Objectives
Upon completion of the course, students will be able to:

1. Apply the principles of the basic sciences and mathematics relative to sample collection, detection, identification, and measurement for the determination of exposure to environmental contaminants.
2. Describe the principle of operation of monitoring and laboratory instrumentation for the determination of contaminants in environmental media.
3. Calculate applicable values for comparison to appropriate environmental and exposure standards and guidelines.
4. Discuss and conduct sampling and some analysis of specific environmental contaminants in various matrices.
5. Apply information to general environmental health practice, including disaster recognition, response, and control activities.
6. Write relevant scientific and technical reports.

Competencies

Foundational Public Health Knowledge Competencies

3. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health
6. Explain the critical importance of evidence in advancing public health knowledge
7. Explain effects of environmental factors on a population's health

Applicable MPH-EHS Specialization Competencies

Upon completion of the course, MPH degree students with specialization in environmental health sciences should be able to:

1. Outline the health challenges that natural and anthropogenic contaminants in the environment can pose to population health
2. Explain the physiological factors that influence human exposure and the uptake of chemical and biological environmental agents
3. Describe federal and state regulatory programs, guidelines, and authorities relevant to environmental and occupational health
4. Access state, federal, and local resources for assessing environmental and occupational health.
5. Determine the role of exposure assessment in environmental and occupational health.

Applicable MS-ES-EPH Competencies

Upon completion of the course, MS students with EPH specialization should be able to:

3. Conduct a research project using appropriate research methods and ethical approaches
5. Communicate in writing and orally the research project's methods, results, limitations, conclusions, and public health relevance
7. Apply the environmental health paradigm (i.e., EHS model) to characterizing hazardous physical, chemical, and biological agents relative to sources, categories, exposure matrices/pathways, distribution, human exposures, responses, societal/regulatory actions, and technological controls

Applicable PhD-EPH Competencies

Upon completion of the course, PhD students with EPH specialization should also be able to:

4. Formulate hypotheses, plan, and conduct a research study using appropriate research methods and ethical approaches
5. Analyze data and prepare an original manuscript, suitable for publication, summarizing the results and interpreting the findings from a research study
6. Communicate in writing and orally the research project's purpose, methods, results, limitations, conclusions, and public health relevance to both informed and lay audiences
8. Apply the environmental health paradigm (i.e., EHS model) to characterizing hazardous physical, chemical, and biological agents relative to sources, categories, exposure matrices/pathways, distribution, human exposures, responses, societal/regulatory actions, and technological controls
9. Work with various stakeholders and other professions to proactively and reactively address environmental and occupational regulatory policy and human health issues and concerns

Text/Readings:

Readings are listed in the course schedule and will be posted on Carmen (https://carmen.osu.edu/#).

Websites: Applicable and useful online resources on the internet include, but are not limited to, the following:

- OSHA: https://www.osha.gov/otm/table-of-contents
- CDC/NIOSH: http://www.cdc.gov/niosh/docs/2003-154/
- CDC: http://www.cdc.gov/labstandards/ & http://www.cdc.gov/nceh//
  Note: Links to mandatory readings from other useful references listed in the syllabus

Optional Reading:

- ***Bisesi & Kohn's Industrial Hygiene Evaluation Methods*** (Bisesi 2003 2nd Edition) Taylor & Francis Publishers – available free online via OSU: https://ebookcentral-proquest-com.proxy.lib.ohio-state.edu/lib/ohiostate-ebooks/detail.action?docID=198991
- ***Exposure Assessment in Environmental Epidemiology*** (Ed by Mark J. Nieuwenhuijsen 2015 2nd Edition)

Carmen

There is a Carmen site for this course: https://osu.instructure.com/courses/189537. All course materials are available via Carmen.

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass-Adding a Device help article for step-by-step instructions (https://admin.resources.osu.edu/buckeyepass/adding-a-device)
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (https://admin.resources.osu.edu/buckeyepass/installing-the-duo-mobile-application) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Class Format: How this course works

- **Mode of delivery:** During the 14-week term, the instructional sessions will consist of the approximate equivalent of 1.0 clock hour per week of asynchronous online lecture sessions plus 3.0 clock hours per week of on-campus/in-person laboratory sessions (Cunz Hall Lab 0430). There are no required sessions when you must be logged in to Carmen at a scheduled time. In addition, there will be assignments consisting of applied case studies, discussions, problem sets/practice exercises, and technical reports. The course content will introduce, reinforce, and complement the required readings relating to the respective topics. Group course projects will be used to reinforce the principles of human exposure monitoring that are taught in the course.

- **Pace of online activities:** Carmen site.

- **Credit hours and work expectations:** This is a **3-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (e.g., lab sessions) in addition to 9 hours of homework/active learning activities (e.g., asynchronous online lectures, assignments, problem sets) to receive a grade of (C) average.

- **Attendance and participation requirements:** To achieve the objectives of this course and to become a public health professional, attendance is expected in all scheduled in-person classes. If a student has an *extenuating* circumstance (e.g., unforeseen medical issues, death in the family, etc.) that prevents them from attending class, they should notify the instructor *before* class.

Course Technology

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Required equipment

- **Computer:** current Mac (Mac OSX) or PC (Windows 10+) with high-speed internet connection
- **Calculator:** Students should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation.
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Optional equipment (for participation in optional live office hours and/or review sessions)

- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone

Required software

- **Microsoft 365 Copilot (formerly Office 365)** All Ohio State students are now eligible for free Microsoft 365 Copilot (formerly Office 365). Full instructions can be found at go.osu.edu/office365help.

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** http://it.osu.edu/help

- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu

Assignments/Assessments

Attendance/Participation: 5%

Students will be graded throughout the semester for their participation in-person and on discussion boards. Discussion questions related to the course required readings will be announced and posted by instructors on the discussion boards.

Mini-assignment: 5%

Students will be given one mini-assignment at the beginning of the semester, and this will be discussed in class. Each student will give a brief presentation how the course relates to their research or interests with concrete examples and background information from the literature on the selected topic. The instructors will give detailed instructions on this assignment in the first week of class.

Problem Sets: 20%

Four take-home problems set (5% each) based on the materials covered during the course sessions. The problem sets will be reviewed by the instructors after the due date, and students will be allowed to submit corrections in one week.

Environmental Sampling Reports: 15%

Three reports will be written based on field sampling completed during laboratory sessions. Guidance about the format of the report will be provided by the instructor.

Self-Directed Project Report and Presentation: 35%

Students will work in groups of two or three to conduct an exposure assessment project with options and guidance provided by the professor. The project will be submitted as a report to the instructor and presented to the class at the end of the course, at the due time specified in the course schedule. Each member of the group will be expected to contribute equally to conducting the project, writing the report, and putting together and delivering the presentation. Members of the group may earn different scores on the group project assignments based on the instructor's assessment of group members contribution. Guidance about the format of the report and presentation will be provided by the instructor.

Portfolio: 20%

Each student will be tasked with assembling a portfolio of course-relevant materials for each session and will be expected to turn them in at the end of the semester on the due date stated in the course outline. There will be opportunities for check-in on portfolio progress at week 5 and 10 by the instructors to give feedback to the students. Instruction about the materials to compile will be provided by the instructor on the first day of class.

Grading

Activity	Points Total (100%)
Attendance/Participation	5
Mini Assignment	5
Problem Sets 1–4	20
Environmental Sampling Report 1 – Particulates	5
Environmental Sampling Report 2 – Gases/Vapors	5
Environmental Sampling Report 3 – Water	5
Self-Directed Project Report	20
Presentation	15
Course Portfolio	20

Grading Scale

A	**93 to 100**	Superb work—thorough, complete, and correct; beyond expectation
A-	**90 to <93**	Outstanding work that reflects mastery of the material and the ability to apply it
B+	**87 to <90**	Excellent—thorough, complete and correct with only very minor errors or omissions
B	**83 to <87**	Very good work that reflects mastery of most of the material
B-	**80 to <83**	Very good—adequately covers the major facets of the material but lacks rigor
C+	**77 to <80**	Good work that reflects mastery of some of the material
C	**73 to <77**	Good work that reflects mastery of a few aspects of the material
C-	**70 to <73**	Mediocre work that reflects familiarity with, but not mastery of the material
D+	**67 to <70**	Mediocre work that reflects familiarity with most of the material
D	**60 to <67**	Mediocre work that reflects little familiarity with the material
E	**Below 60**	Poor—incomplete and incorrect

Class Policies

Please note that students are discouraged from using mobile devices while in class and that the use of computers is only allowed if such use is related to class activities.

Copyright Statement

The syllabus, class schedule, class readings (or links to class materials), and lecture slides will be posted on the Carmen/Canvas site for the course. This syllabus and all course materials (e.g., homework assignments, solution keys, and course materials) are under copyright by the instructor and cannot be posted elsewhere without written permission.

Generative AI Policy

Given that the learning goals of this class are learning to use monitoring techniques and methods to assess exposure and risk, in this course, students are welcome to explore innovative tools and technologies for data analysis or sampling plan design, including generative artificial intelligence (GenAI). Students are permitted to use GenAI tools for most course assignments, except for the final project report. Although use of GenAI is allowed, your written assignments, including problem sets and technical reports, should be your original work.

If we suspect that you have used GenAI on an assignment for which it is prohibited, we will ask you to explain your process for completing the assignment in question. Submission of GenAI-generated content as your original work is considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. The unauthorized use of GenAI tools will result in referral to the Committee on Academic Misconduct.

Office of Student Life: Disability Services

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with us as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let us know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu, 614-292-3307, or slds.osu.edu.

Mental Health Services

As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know is suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and the 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766, and 24-hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious Beliefs or Practices Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices following applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors, in turn, shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations concerning examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure-initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing, during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Civil Rights Compliance Office. (Policy: Religious Holidays, Holy Days and Observances)

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct.

Intellectual Diversity

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Grievances and Solving Problems

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in Faculty Rule 3335-8-23, the CPH Graduate Student Handbook, and the CPH Undergraduate Student Handbook. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

Online reporting form at http://civilrights.osu.edu/,
Call 614-247-5838 or TTY 614-688-8605,
Or Email civilrights@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Course Outline

Week	Class	Date	Readings & Topics
1	General Introduction (In-person Lecture)	08/29/2025	• Introducing the Course and Giving a Roadmap of the Semester • Principles of Exposure Monitoring • Properties of Applicable Matrices • Summary of Sampling Categories - NIOSH Manual of Analytical Methods. "Quality Assurance" - http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-c.pdf - OSHA Technical Manual Section II – Chapter 1 - https://www.osha.gov/otm/section-2-health-hazards/chapter-1 - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Units 1, 2 **Pre-Class OSU Environmental Health and Safety Trainings** **Mini Assignment Assigned**
2	Air Quality & Exposure Monitoring (Asynchronous Lecture)	Prior to in-person session	• Air Pollution • Air Matrix Characteristics • Air Monitoring • Exposure Standards • Occupational Exposure - NIOSH Manual of Analytical Methods. "General Consideration for Sampling Airborne Contamination" https://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-d.pdf - OSHA Technical Manual Section II – Chapter 1 App F https://www.osha.gov/otm/section-2-health-hazards/chapter-1#Appendix_F - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 3

Week	Class	Date	Readings & Topics
	Instrument Adjustment & Calibration (In-person Lab Session)	09/05/2025	**Lab Exercise:** 1. Compare different primary and secondary calibrators 2. Use primary calibrator to adjust flow on multi-flow pump 3. Calibrate rotameter using primary standard 4. Use secondary standard calibrator (rotameter) to adjust flow on multi-flow pump **Mini Assignment Due**
3	Integrated Monitoring of Particles (Asynchronous Lecture)	Prior to in-person session	• Air Matrix • Integrated ("Continuous") Air Sampling of Dust, Fume, and Fiber Particulates • Gravimetric Analysis of Total and Respirable Dust Samples - NIOSH Manual of Analytical Methods. "Factors Affecting Aerosol Sampling" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-o.pdf - NIOSH Manual of Analytical Methods. "Aerosol Sampling: Minimizing Particle Loss from Cassette Bypass Leakage" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-n.pdf - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Units 4, 5, 6, 7

Week	Class	Date	Readings & Topics
	Calibration Train & Particle Sampling Train (In-person Lab Session)	09/12/2025	**Lab Exercise and Field Sampling:** 1. Disassemble and reassemble various cassettes with filters 2. Disassemble and reassemble applicable respirable dust cyclones 3. Set-up calibration trains for personal and area sampling for particulate matter 4. Calibrate multi-flow pumps for applicable air sampling 5. Set up sampling trains for personal and area sampling for particulate matter 6. Field practice – indoor and outdoor measurement exercise (integrated air sampling for chemical aerosol/particulate analysis) **Problem Set 1 Assigned** **Environmental Sampling Report 1 Assigned**
4	Instantaneous Monitoring of Particles (Asynchronous Lecture)	Prior to in-person session	• Air Matrix • Instantaneous ("Real-Time") Air Sampling of Total and Respirable Dusts (Particulate Matter) - NIOSH Manual of Analytical Methods. "Aerosol Photometers for Respirable Dust Measurements" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-g.pdf - OSHA Technical Manual Section II – Chapter 3 https://www.osha.gov/otm/section-2-health-hazards/chapter-3 - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 8

Week	Class	Date	Readings & Topics
	Calibration & Use of Instantaneous Particle Monitors (In-person Lab Session)	09/19/2025	**Lab Exercise:** 1. Demonstrate operation of instantaneous air monitors for particulate matter 2. Calibrate instantaneous air monitors for particulate matter 3. In-lab sampling exercise (integrated and instantaneous air sampling for particulate matter) **Problem Set 1 Due**
5	Alternative Exposure Assessment Methods (Asynchronous Lecture)	Prior to in-person session	• Alternative exposure assessment methods- qualitative methods • Introduction to biomonitoring and biomarkers - A Comparison to Survey Research – Chapter 2 (Section titled "Experiments on Question Form") and Chapter 3 (the first 3 sections) http://methods.sagepub.com/book/a-companion-to-survey-research - Journal Article by Manno et al., 2010. Biomonitoring for Occupational Health Risk Assessment (BOHRA). Toxicology Letters Volume 192, Issue 1, Pages 3-16 https://www.sciencedirect.com/science/article/abs/pii/S0378427409002483 - (Optional) *Exposure Assessment in Environmental Epidemiology, 2nd Ed. Ed by Mark J. Nieuwenhuijsen –Chapters 2 and 6* - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 14
	Surface Sampling (In-person Lab Session)	09/26/2025	**Lab Exercise:** 1. Introduction to aseptic sampling techniques (?) 2. Surface microbial sampling with contact plates and adhesive microscope slides 3. Swab surface sampling demonstration **Environmental Sampling Report 1 Due**

Week	Class	Date	Readings & Topics
6	Integrated Monitoring of Gases (Asynchronous Lecture)	Prior to in-person session	• True Gases and Vapors • Integrated Air Monitoring of Gases - NIOSH Manual of Analytical Methods 1500 for Hydrocarbons http://www.cdc.gov/niosh/docs/2003-154/pdfs/1500.pdf - NIOSH Manual of Analytical Methods 2016 for Formaldehyde https://www.cdc.gov/niosh/docs/2003-154/pdfs/2016.pdf - NIOSH Manual of Analytical Methods 5506 for PAHs https://www.cdc.gov/niosh/docs/2003-154/pdfs/2016.pdf - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 9, 10
	Calibration & Integrated Gas Sampling (In-person Lab Session)	10/03/2025	**Lab Exercise:** • Examine various sampling media for gases (adsorbent tubes, impingers, bubblers, diffusion tubes) • Set-up sampling trains for simulated personal and area air sampling • Indoor monitoring including concurrently sampling for particle and gas phase compounds in line **Problem Set 2 Assigned**
7	Instantaneous Monitoring of Gases (Asynchronous Lecture)	Prior to in-person session	• Instantaneous ("Real-Time") Air Sampling of Gases • Parameters and Protocol for Monitoring Indoor Air Quality - NIOSH Manual of Analytical Methods. "Aerosol Photometers for Respirable Dust Measurements" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-h.pdf - OSHA Technical Manual Section II – Chapter 3 https://www.osha.gov/otm/section-2-health-hazards/chapter-3 - OSHA Technical Manual Section III – Chapter 2 https://www.osha.gov/otm/section-3-health-hazards/chapter-2 - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 11, 12, 13

Week	Class	Date	Readings & Topics
	Instantaneous Gas Sampling (In-person Lab Session)	10/10/2025	**Lab Exercise and Field Sampling:** 1. Demonstrate operation of instantaneous air monitors for gases 2. Calibrate instantaneous air monitors for gases 3. In-lab sampling exercise 4. Apply monitoring instruments to indoor air monitoring **Problem Set 2 Due** **Environmental Sampling Report 2 Assigned**
8	No Classes (Autumn Break)	10/17/2025	
9	Integrated Monitoring of Bioaerosols (Asynchronous Lecture)	Prior to in-person session	• Bioaerosols • Integrated Monitoring of Particulates-Bioaerosols - NIOSH Manual of Analytical Methods. "Sampling and Characterizing Bioaerosols" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-j.pdf - (Optional) Bisesi and Kohn's Industrial Hygiene Evaluation Methods – Unit 15
	Bioaerosols Sampling (In-person Lab Session)	10/24/2025	**Lab Exercise:** 1. Disassemble and reassemble impactors with Agar media 2. Calibrate high-volume pumps for applicable air sampling type and medium 3. Set up sampling train for simulated bioaerosol area air sampling 4. Field practice – Indoor and outdoor exercise

Week	Class	Date	Readings & Topics
10	Analysis of Bioaerosols (Asynchronous Lecture)	Prior to in-person session	• Culture-based analysis of bioaerosols • Molecular analysis of bioaerosols - Mbareche et al., 2017. Bioaerosol sampling and detection methods based on molecular approaches: No pain no gain. *Science of the Total Environment*. https://doi.org/10.1016/j.scitotenv.2017.05.076 - Unterwurzacher et al., 2018. Validation of a quantitative PCR based detection system for indoor mold exposure assessment in bioaerosols. https://doi.org/10.1039/C8EM00253C - NIOSH Manual of Analytical Methods. "Sampling and Characterizing Bioaerosols" http://www.cdc.gov/niosh/docs/2003-154/pdfs/chapter-j.pdf
	Molecular Techniques (In-person Lab Session)	10/31/2025	**Lab Exercise:** • Bioaerosol sample analysis: plate counting and PCR **Problem Set 3 Assigned** **Environmental Sampling Report 2 Due**
11	Alternative Exposure Assessment Methods (Asynchronous Lecture)	Prior to in-person session	• Pollen biomonitoring for community health • Exposome - Suanno et al., 2021. Monitoring techniques for pollen allergy risk assessment. Environmental Research. https://doi.org/10.1016/j.envres.2021.111109 - Rai et al., 2017. End-user perspective of low-cost sensors for outdoor air pollution monitoring. Science of the Total Environment. https://doi.org/10.1016/j.scitotenv.2017.06.266

Week	Class	Date	Readings & Topics
	Pollen Sensor Data Analysis (In-person Lab Session)	11/07/2025	**Lab Exercise:** • Pollen sensor demonstration • Pollen sensor data analysis **Problem Set 3 Due**
12	Water Quality Week I (Asynchronous Lecture)	Prior to in-person session	• Water quality and standards • Environmental sampling for microbial analysis - Dufour, 2021. A short history of methods used to measure bathing beach water quality. Journal of microbiological methods. https://doi.org/10.1016/j.mimet.2021.106134 - US EPA Method 1603: https://19january2017snapshot.epa.gov/sites/production/files/2015-08/documents/method_1603_2009.pdf - (Optional) *Exposure Assessment in Environmental Epidemiology, 2nd Ed. Ed by Mark J. Nieuwenhuijsen –Chapter 16*
	Water Sampling (In-person Lab Session)	11/14/2025	**Lab Exercise and Field Sampling:** • Outdoor water sampling • Water sample processing **Problem Set 4 Assigned**

Week	Class	Date	Readings & Topics
13	Water Quality Week 2 (Asynchronous Lecture)	Prior to in-person session	• Culture-based v. molecular water quality testing • Microbial source tracking and emerging water quality tools - Gorski et al., 2019. New strategies for the enumeration of enteric pathogens in water. Environmental microbiology reports. https://doi.org/10.1111/1758-2229.12786 - Cloutier & McLellan, 2017. Distribution and Differential Survival of Traditional and Alternative Indicators of Fecal Pollution at Freshwater Beaches. AEM. https://doi.org/10.1128/AEM.02881-16
	Water Analysis (In-person Lab Session)	11/21/2025	**Lab Exercise:** • Plate counting and CFU calculations • DNA extraction and qPCR **Problem Set 4 Due** **Environmental Sampling Report 3 Assigned**
14	No Classes (Thanksgiving Break)	11/28/2025	
15	Personal Protective Equipment (PPE) & Project Presentations (In-person Lab Session)	12/05/2025	• In-person discussion of PPE in occupational setting • Group Project Presentations **Environmental Sampling Report 3 Due**
16	Final Project Report	12/12/2025	**Final Project Report Submission on Canvas**

Alignment of Competencies with Assessments

Competencies	Assessment 1 (Min-assignment)	Assessment 2 (Problem Sets)	Assessment 3 (Environmental Sampling Reports)	Assessment 1 (Self-directed Projects)	Assessment 5 (Course Portfolio)
Foundational Public Health Knowledge Competencies					
3.Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health		X	X	X	
6.Explain the critical importance of evidence in advancing public health knowledge	X	X		X	X
7.Explain effects of environmental factors on a population's health	X	X		X	X
Applicable MPH-EHS Specialization Competencies					
1.Outline the health challenges that natural and anthropogenic contaminants in the environment can pose to population health	X		X		
2.Explain the physiological factors that influence human exposure and the uptake of chemical and biological environmental agents		X			X
3.Describe federal and state regulatory programs, guidelines, and authorities relevant to environmental and occupational health			X	X	X
4.Access state, federal, and local resources for assessing environmental and occupational health.			X	X	X
5.Determine the role of exposure assessment in environmental and occupational health.	X	X			X
Applicable MS-ES-EPH Competencies					
3.Conduct a research project using appropriate research methods and ethical approaches				X	

5.Communicate in writing and orally the research project's methods, results, limitations, conclusions, and public health relevance	X			X	
7.Apply the environmental health paradigm (i.e., EHS model) to characterizing hazardous physical, chemical, and biological agents relative to sources, categories, exposure matrices/pathways, distribution, human exposures, responses, societal/regulatory actions, and technological controls	X	X	X	X	X
Applicable PhD-EPH Competencies					
4.Formulate hypotheses, plan, and conduct a research study using appropriate research methods and ethical approaches				X	
5.Analyze data and prepare an original manuscript, suitable for publication, summarizing the results and interpreting the findings from a research study			X	X	
6.Communicate in writing and orally the research project's purpose, methods, results, limitations, conclusions, and public health relevance to both informed and lay audiences	X			X	
8.Apply the environmental health paradigm (i.e., EHS model) to characterizing hazardous physical, chemical, and biological agents relative to sources, categories, exposure matrices/pathways, distribution, human exposures, responses, societal/regulatory actions, and technological controls	X	X	X	X	X