THE OHIO STATE UNIVERSITY
COLLEGE OF PUBLIC HEALTH

PUBHEHS 6310 – Principles of Environmental Health Sciences
3 credits – Autumn 2025
Tuesday and Thursday /1420 – 1540 /TBD with online synchronization options

Course Instructor
Mark H. Weir EIT, Ph.D., Environmental Engineering, Drexel University, August 2009
Associate Professor Division of Environmental Health Sciences, and College of Public Health Interim Associate Dean of Research
Cunz 426, 614-292-4066
weir.95@osu.edu
Instructor's Office Hours
Wednesdays 1100 – 1200 otherwise reach out over OSU email (not carmen email please) and schedule an time to meet.

Additional Faculty Instructor: Olorunfemi Adetona, Ph.D., Toxicology, University of GA, 2009

Faculty Feedback & Response Time: [update as desired]
The following gives you an idea of my intended availability during the course:

- **Grading:** You can generally expect feedback within 7 days.
- **E-mail:** Please **do not** use Carmen, only my osu email; weekdays I will reply within 48 hours.
- **Discussion board:** We are a small group, please come to office hours, or email for questions

Course Description: What is EHS? What do EHS professionals do? What are the modern methods and concepts that EHS professionals need? Those are fundamental concepts that this course will delve into.

As a mammalian organism, humans are impacted by environmental stressors, and we want to know quantitatively what those exposures mean. These stressors include chemical, physical and microbiological agents, which we are exposed to via the air, water, soil/food and combinations of these matrices. It is our hope to not only educate but inspire the desire for more information and learning, either self-acquired or mediated via additional EHS courses here at OSU and beyond. You will learn much of the basic knowledge required for EHS professionals and a strong focus on their application into the risk assessment methodology, which we all use intensely. This course is developed as a team-taught course, and both Dr. Adetona and I have dedicated our professional lives to EHS and EHS-associated fields.

Prerequisites
None

Course Learning Objectives

1. Categorize types of hazardous environmental agents
2. Assess the quality and comparability of data collected in environmental sciences.
3. Describe how environmental sampling studies are designed and executed.
4. Describe the general methodology for quantitative health risk assessment
5. Communicate an assessment of hazards in the environment

Applicable MPH Degree EHS Specialization Competency

5. Apply various risk assessment, risk management and risk communication approaches for environmental hazards.

Textbook Readings for PUBHEHS 6310 : Readings delivered on weekly basis
E-Book (free online via OSU Library): Delivered as appropriate on weekly basis

Carmen (Canvas)
As with all CoPH courses, we use a Carmen (Canvas) site for course management, you will have already been provided access to this site, please contact Dr. Weir should you have issues connecting to Carmen or the other technology tools being used.

Class Format: how this course works
Mode of Delivery:
In-person with synchronous online options:
https://osu.zoom.us/j/96698091974?pwd=YKrITK9Wvf3zBkyoaYORh0suJaY60M.1

Meeting ID: 966 9809 1974
Password: BPRA-Best
One tap mobile
+16468769923,,96698091974#,,,,0#,,067009458# US (New York)
+16513728299,,96698091974#,,,,0#,,067009458# US (Minnesota)

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)

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

Credit Hour-Based Work Expectations: This is a **3-credit-hour** course. According to Ohio State policy (go.osu.edu/credithours), students should expect 3 hours per week of time spent on direct instruction, in addition to 9 hours of homework/active learning activities to receive an average grade of C.

Generative AI Policy
It is our job as faculty to teach you to learn to use technology ethically and correctly. As such I will lead through example in the lab sessions on ethical use of AI in research, sciences and engineering. If used in course submissions, you must provide the following: model used; prompt used; validation/verification plan used.

Course Structure, Assignments and Grading

Course Blocks
The course is split into two separate blocks. The first being Foundations. Foundations block will work through the principal components of EHS and how environmental decisions are made for health benefits. In this block we will go through from what a hazard is, through the exposure pathway concepts, to understanding risks, data analysis, study design and disparities and changes in

susceptibility in populations. This foundations block will set the stage for the Methods/Tools block to follow. The Methods/Tools block will present the classical basis for and modern develop of environmental sampling and analysis methods. With a primary focus on the molecular basis of disease via Exposure, this block will be a cornerstone of implementable knowledge for EHS professionals.

Each block is then comprised of modules that will deliver the instructional material from one of the team of faculty who are instructing this course. Due to the expertise that we have throughout the Division, you will gain valuable instruction from them in their chosen area of professional work and research.

Course Release Schedule

The course is in-person with synchronous online capabilities, and as such everything is accessible online through the Carmen Canvas system. **Attendance at the lectures and the labs is mandatory for success**, but since we're all adults, I will not grade your attendance. Science is a tower, you need to learn from each step along the way before moving to the next, understanding that is just the beginning.

Course Grading

Portfolio (Except Module F3 – see below)

This course is based on not only developing knowledge but an appreciation for EHS sciences. To foster this learning, you will be creating a portfolio of your time in the course. This is intended to be a digital documentation of your exploration of **concepts in this course that interest you in alignment with course topics, objectives, and your career and life**. Your portfolio must demonstrate connections that are personal, professional, while also based in science and research. For module F3 a specific requirement is being levied, please refer below the preferred format to view that.

It is greatly preferred to use Microsoft Sway via the Microsoft 365 platform (https://goo.gl/wy4FK1) and the portfolio template. All OSU students have free access to this technology. Based on the topic of the week that the lecture and reading is on, the portfolio must include an image (free for reuse from google, or own work/picture) that describes how this topic impacts or is incorporated in your daily life, with some text explaining it. This is not intended to be writing intensive; therefore, this portfolio template will maintain a concise writing style. Prezi presentations are a potential alternative submission option. However, these cannot be more than 2 – 3 slides to maintain the concise writing requirement for all students.

Module F3 Portfolio Submission ONLY

For this lab you can follow the directives for the scenario below, or you can use your own research or data of interest, so long as you have a similar set of inferences by the end. The recitation session before this F3 is released will be helpful to AMA.

Unless you use your own separate data, you will track and record your water use for 2 – 7 days, minimum of 3 days to determine variability in water use. For toilets you can refer to the volume per flush (lpf is liters per flush and gpf is gallons per flush). Then you can track how much water you use to make coffee, estimate how much for cooking. For bathing, if you shower, refer to manufacturer specifications for showerhead flow rates and then [flow rate * time in shower] will give you volume of water used. Make an effort to track all water used, maintain your categories and compare to the National Average for each category, a good starting place is the WaterSense Program. Assess visually and where possible quantitatively your water use compared to national averages.

For the F3 portfolio submission you will need to account for the following in the analyses:

- Defend the use of chosen software – R, SAS, Excel, SPSS, or other
    - You will learn some of what to do in R, so if you want to learn – learn by doing!
- Defend the analysis method chosen and used – *e.g.* point value comparisons or with larger data whether normality needed to be demonstrated, non-parametric tests, *etc*.
- Demonstrate results and discuss what the results mean
- Include further information needed for improved inferences

Course Project, Milestones, Report and Presentation

Rather than tests, quizzes or other traditional means of evaluation – which rarely test your ability to use knowledge – we will be using a project-based learning approach. This project will have you work through a hazard assessment, the first phase of a risk assessment, and then outline the initial conceptual stages of a risk assessment of the hazard. This will be broken into multiple stages and steps all guided through both the lectures and the lab sessions.

Grading Breakdown

Table 1: Assignments and points associated with them

Assignment & Frequency	Points	% Grade	Notes
Portfolio	3 points each * 12 weeks = 36 points	21	Assess the integration of knowledge to your life, career, or interests in a written and multimedia presentation format using the Microsoft Sway program.
Culminating Portfolio	10 points * 1 week = 10 points	6	Assess the impact that the course had on you, lessons learned, approach taken and other communications desired at the end of the course in a formal recorded audio or video format.
Project Milestones	10 points = 100 points	56	Assess combined concept application from fundamentals to methods and applications of those methods
Final Project Report	20 points	11	Demonstrate written communication skills and the ability to synopsize the convergence of multiple milestone components into a single final report.
Final Presentation	10 points	6	Demonstrate oral communication skills in a professional presentation format of scientific knowledge and quantitative facts gathered or generated over the course of the term.
Total	**176**	**100**	

Table 2: Grade to letter-grade breakdown

Grade	Percentage	Interpretation
A	100 – 93	Outstanding performance; consistent exceptional depth of understanding

Grade	Percentage	Interpretation
		and/or creative application of concepts.
A-	92.9 – 90	Very strong performance with demonstrated depth of understanding and/or ability to apply course concepts
B+	89.9 – 87	Performance at an expected level; work is complete and shows solid understanding and application of course concepts
B	86.9 – 83	Adequate performance: work is complete but shows some limitations in grasp or ability to apply course concepts
B-	82.9 – 80	Marginally acceptable; work is conducted only to meet minimum course requirements
C+	79.9 – 77	Grades below B- indicate significant problems in understanding or applying course concepts and/or failure to meet stated course requirements.
C	76.9 – 73	
C-	72.9 – 70	
D+	69.9 – 67	
D	66.9 – 60	
F	<60	

Course Policies:

I will treat all students will the respect due to adults in professional development. If you feel that you need to discuss my approach or teaching methods, please do so in the office hours, phone call, in-person meeting or other communication. Please treat each other and all faculty engaged in the course with the respect they are due.

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 me know immediately so that we can privately discuss options. To establish reasonable accommodations, I will require you to register with Student Life Disability Services. After registration, plan work with them to establish the appropriate 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 me 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 are 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 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.

Academic Integrity: Effectively said enough, don't cheat. However, to elaborate on this. The only concern on portfolio is copying a fellow classmate's material, but that assignment is designed to make that a senseless act since those are documents about your career and goals. Otherwise always watch out for plagiarism. It can be an unintentional occurrence, simply not deleting placeholder text, but it will be dealt with in accordance with OSU standards and practices. I take a strongly negative view on plagiarism, in that I view it as theft. I will be using iThenticate through the OSU system, and those noted as high likelihood of plagiarism I am obliged to report to the Committee on Academic Misconduct (COAM) for them to complete a formal investigation.

This is because I am a mandatory reporter to COAM, and that It is the responsibility of COAM 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.

The Ohio State University's Code of Student Conduct (Section 3335 -23-04) defines Academic misconduct as: *"Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the Student Handbook. Ignorance of the Code of Student Conduct and the Student Handbook is never considered an "excuse" for academic misconduct.*

If any faculty member suspects a student of academic misconduct in a course, the course's Co-Directors are obligated by University Rules to report these suspicions to the University's Committee on Academic Misconduct. If COAM determines that the student has violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact us.

Religious Beliefs or Practices Accommodations
Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with 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 with regard to 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)

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.

Course schedule starting on next page

Table 3: Course Topic Schedule

Module – Release Date – Faculty Instructor	Module Topics	Readings	Milestone Due
F1 – 26 Aug – Hazards in Matrices – Weir F1 Lab – 28 Aug – choose hazard	1. Defining Environmental Health Science 2. What is a hazard to environmental systems in the context of environmental matrices? 3. What is a hazard to human health in the context of environmental matrices? 4. Interpreting and using the EHS model	Readings 1. Air 1 2. Air 2 3. Water 1 4. Water 2 5. Soil 1 6. Soil 2 7. Soil 3 8. Food	
F2 – 2 Sept – Exposures in Matrices – Weir F2 Lab – 4 Sept – Outlining exposure pathways	1. What are exposure pathways and portals of entry? a) Exposure networks in the context of systems environmental matrices 2. How do we measure and assess exposures? a) Hazard to risk continuum 3. Data and conceptual differences in exposure vs epidemiology	Readings 1. Opportunistic 2. Pathogen dynamics 3. Alternative view	Hazard: 1-page memo describing the hazard chosen, why it's chosen, and expected pitfalls / challenges.
F3 – 9 Sept – Data Analysis – Weir F3 Lab – 11 Sept – Data analysis	1. Environmental data analysis a) Hypothesis testing and study design vs data analysis and inference development b) EDA 1. Plotting; statistical moments; data distributions; probability distributions c) Means tests – data limitations and needs d) Distribution tests – data limitations and needs e) Cluster analyses f) Inference development	Readings 1. Bayes Theorem simplified 2. Detection Limits 3. Practical data analysis metagenomics	1- to 2-page memo describing the exposure pathway. Graphical abstract necessary

	2. Using R to conduct and report on data analyses		
F4 – 16 Sept – Study Design – Adetona F4 Lab – 18 Sept – Study Design	1. Planning for environmental sample collection 2. How is environmental sampling executed? 3. Types of sampling schema a) Random, pseudorandom, grid, *etc.* b) How to plan for and choose among schema c) Impacts of sampling on resulting data quality	Readings 1. EPA Sampling document provided in Carmen – Chapter 2 2. Other pages as assigned by Dr. Adetona in the module lecture.	1- to 2-page memo outlining the data analysis needs if any for hazard prevalence, and exposure.
F5 – 23 Sept– Disparities and Susceptibilities – Hood F5 Lab – 25 Sept – Sensitive subpopulations	1. How is health affected by socioeconomic condition? 2. Cultural impacts to environmental health controls and interactions	Readings 1. Preventing injustice 3. Applied Exposome	1- to 2-page memo describing the study design required for further risk assessment development. Graphical abstract required.
Module – Release Date – Faculty Instructor	**Module Topics**	**Readings and Interaction**	**Milestone Due**
M1 – 30 Sept – Microbiology – Weir M1 Lab – 2 Oct – microbiological impacts	1. Pathogens vs environmental microbes 2. Microbiologically derived toxins a) Hazard and risk assessment of infectious disease hazards b)	Readings 1. Waterborne viruses 2. Swimming Ponds	1- to 2-page memo describing the specific communities, racial, demographic, or social groups are higher risk/susceptibility.
M2 – 7 Oct – Applied microbiology M2 Lab – 9 Oct – microbial processes	1. Persistence, survival and growth 2. Environmental dynamics of microbial lifecycles	Readings 1. Uploaded to Carmen	
M2 – 14 Oct – Infectious Diseases – Weir M2 Lab – Integrated into lecture – break on 16 and 17 Oct	1. Infectious disease prevention 2. Using culture, molecular methods, and novel molecular methods in assessing exposure and risks.	Readings 1. Risk Assessment and Molecular Methods Data 2. QMRA and Opportunistic infections 3. Climate change and	1- to 2-page memo describing one of the following • For chemical hazards, microbial interactions with or degradation in the environment

		health impacts	• For microbial hazards, persistence in the environment and pathogenesis in the host.
M3 – 21 Oct – Transmission and Fate & Transport Modeling – Weir M3 Lab – 23 Oct – Integrating qualitative and quantitative modeling	1. Considerations for choosing molecular methods 2. Strengths and weakness of molecular methods 3. Intro to methods for microbial hazards and derived toxins	Readings 1. Omics for Nurse Scientist 2. Integrative Omics for Health – Access Via Institution link 3. Science of Omics - Perspectives	
M4 – 28 Oct – Water Quality Control – Weir M4 Lab – 30 Oct – Engineering interventions for water and food	1. What are genomics such as: proteomics, metabelomics, and other 'omics' methods? 2. What are their place in EHS professions and research?	Readings 1. Integrating Omics – Click Download Doc 2. Evolution PH Genomics 3. Multi-omics approaches	1- to 2-page memo describing one of the following • Infectious disease risk or transmission modeling options that **could** be explored for health assessments. • Wider spectrum chemical hazard-induced health assessments, such as epigenetic or other impacts expected.
M5 – 4 Nov – Air Quality Management – Weir M5 Lab – 6 Nov – Deeper dive into engineering interventions	1. Microbial and chemical hazards' removal from the air 2. Indoor air 3. Emissions to the environment	Readings 1. COVID and Indoor Air risks 2. Legionella and health risks	
M6 – 13 Nov – Toxicology and the Exposome – Weir No lab Veterans' Day on 11 Nov	1. Fundamental concepts in toxicology 2. Methods in toxicological analyses a) Laboratory & Computational	Readings 1. Citizen Science 2. Using Exposome	1- to 2-page memo describing an engineering intervention that is possible for the hazard.
M7 – 18 Nov – Risk Analysis 1 – Weir	1. Fundamentals of health risk analysis a) Examples of risks to human health	Readings 1. The words of risk	

M7 Lab – 20 Nov – Risk assessment planning	& infrastructure 2. Using R to assess combination of hazard data, and methods of assessing and modeling exposure	2. Historical perspective of risk 3. Risk Bites Playlist	
M8 – 25 Nov – Risk Analysis 2 – Weir M8 Lab – integrated into lecture, Thanksgiving on 27 Nov	1. Fundamentals of dose-response and risk characterization a) Examples of risks to human health & Infrastructure 2. Using R and Python to assess microbial risks	Readings 1. Chapter 1 and 3 of manual 2. Basics of dose-response in context of an App.	1- to 2-page memo describing a possible risk assessment process flow that could be explored further. Graphical presentation required.
M9 – 2 Dec – Frontiers – Weir M9 Lab – 4 Dec – Future considerations for hazard and population	1. Forefront issues in EHS and risk assessment 2. Conceptualizing realistic health impacts and risks	Readings To be released on Carmen	1- to 2-page memo describing if a federal risk assessment, GRAS, or hazard assessment has already been completed for the hazard. **Culminating portfolio due**
M10 – 9 Dec – Wrap up open discussion	1. Open discussion of work to date on course material, reports etc. 2. Wrap up of residual topics covered only lightly in the course to date. 3. Discussion on the future of EHS, public health and environmental and engineering sciences in a changing environment.	Readings To be released on Carmen	
12 Dec – 1600 - 1745	**FINAL Presentations – Reports Submitted on Evening of 9 Dec by 2359.**		**Due 9 Dec by 2359 → 5-page report converging the information provided through the milestones to describe an overall hazard assessment and proto risk assessment.**

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Remember to go outside, enjoy the sun, the warm, the cold, the rain, the snow, the whatever it is doing; the birds, the bugs, the grass, the sky, the squirrels; all the wonder and splendor that is our world.

Life can be tragically short, or wonderfully long. May your days be long, and your time be prosperous. Thank you for journeying into EHS with us.

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