ENVH 563: Health & Safety of Physical Agents in the Workplace

Quarter: Spring 2025
Credits & Grading: 3 credits, graded
Days/Times: Monday and Wednesday, 2:30 to 3:50
Location: Health Sciences Education Building, Rm 430 (HSEB 430)
Final: Due June 12, 2025, no class meeting during finals week

Instructor:

Marty Cohen, Teaching Professor
Office: Roosevelt Bldg.
Email: mcohen@uw.edu
Phone: 206-616-1905
Office Hours: By appointment

Course Description

This is an introductory course covering evaluation and prevention of hazards due to physical hazards in the workplace. Hazards addressed include noise, vibration, physical agents, ionizing and non-ionizing radiation and thermal stress. The course is intended mainly for upper division undergraduate and graduate students in Environmental Health, Safety Engineering, Industrial and Systems Engineering, and Exposure Sciences, including Occupational Hygiene. For each topic area, we will address basic physical concepts, health risks, measurement techniques, interpretation of guidelines and standards, and control techniques.

Learning Objectives

At the end of this course, the student should be able to:

1. Define characteristics of multiple physical agent exposures using appropriate terminology and units.
2. Calculate exposures to physical agents over time and energy levels (e.g., sound and electromagnetic frequency, particle energies).
3. Determine if exposures exceed current guidelines for acceptable exposure.
4. Explain how physical agents interact with human tissues or organs to produce changes associated with health outcomes.
5. Evaluate worker and community exposures to physical agents using common measurement tools and techniques.
6. Determine appropriateness of various personal protective devices for physical agents.
7. Describe and recommend alternative control techniques for physical agents.

Schedule

The Modules Page provides a session-by-session schedule and links to all necessary course materials.

Textbook and Readings

Required readings are available from the Modules page and listed in the session-by-session schedule below. In addition, the following textbooks are recommended, but optional resources:

- Occupational Ergonomics – Principal and Applications. F. Tayyari and J.L. Smith. 1997 (optional)
- The Noise Manual. AIHA Press (optional)
- Radiation Protection, Jacob Shapiro. Harvard University Press, 4th edition. 2002. (optional)
- Any supplemental class reading materials will be posted and made available as needed on the Modules page.

Assignments and Grading

All students will be expected to complete assigned readings and come to class prepared to engage in class discussion on assigned topics. There will be a total of 4 problem sets including the write-up of laboratories addressing measurement and control of physical hazards. Laboratories will be conducted as group exercises and written up individually. There will be a cumulative "take-home" final exam. Grading will be as follows:

Assignment/Assessment	Contribution to Final Grade
Problem Sets/Labs (4 at 12.5% each)	50%
Final Exam	50%
TOTAL	**100%**

Class participation
No points will be awarded for class participation, but your participation will be expected.

Final Exam
The final exam will be based on a video. Please ensure that you are able to view the video far enough in advance to allow you to troubleshoot viewing the video if needed. It may also be possible to view the video on a virtual reality headset. Please get in touch, if you would like to try this (it's pretty cool). An excuse of not being able to view the video will not be considered lightly.

Class Schedule

Module	#	Date	Day	Detail	Instructor	Assignment due
Introduction (0)	1	31-Mar	Mon	Introduction to class	Cohen	
Ionizing Radiation (1)	2	2-Apr	Wed	Fundamentals and external radiation protection dosimetry	Campbell	
	3	7-Apr	Mon	Radiation protection, dosimetry, internal exposures, radionuclides	Campbell	
	4	9-Apr	Wed	Protection standards, regulations, waste, and instruments	Campbell	
	5	14-Apr	Mon	Measurement demo	Campbell	
Non-ionizing Radiation (2)	6	16-Apr	Wed	Part 1	Yost	
	7	21-Apr	Mon	Part 2	Yost	Ionizing Rad
	8	23-Apr	Wed	NIR Lab	Yost	
Noise (3)	9	28-Apr	Mon	Introduction	Croteau	
	10	30-Apr	Wed	Measurement	Croteau	NIR
	11	5-May	Mon	Noise control	Croteau	
	12	7-May	Wed	Hearing loss prevention programs	Croteau	
	13	12-May	Mon	Measurement and controls lab	Cohen	
WMSD (4)	14	14-May	Wed	L1 - Lower back	Spielholz	
	15	19-May	Mon	L2 - Upper extremities	Spielholz	Noise
	16	21-May	Wed	Lab (ergo tools)	Spielholz	
Memorial Day holiday	**17**	**26-May**	Mon	**No class**		
Thermal Stress (5)	18	28-May	Wed	Intro	Cohen	WMSD
	19	2-Jun	Mon	Assessment & Control	Cohen	
Tour of UW CENPA	20	4-Jun	Wed			
Final exam	21	June 12	Tue			Final Due

Session	Topic	Readings/Assignments
Course Introduction		
1	Course overview and introduction	• Haddon, William. "Advances in the Epidemiology of Injuries as a Basis for Public Policy." Public Health Reports (1974), vol. 95, no. 5, 1980, pp. 411–421. • Wertheimer, N, and Leeper, E. "Electrical Wiring Configurations and Childhood Cancer." American Journal of Epidemiology, vol. 109, no. 3, 1979, pp. 273–284.
MODULE 1: Ionizing Radiation		
2	External radiation exposures	• Part 1: pages 9-11, Part 2: pages 18-20, 23-33, 33-35, 44-46, 50-51, 62-63, 71-77, Part 3: pages 178-179 in: Shapiro, Jacob. Radiation Protection: A Guide for Scientists, Regulators, and Physicians. 4th ed., Harvard University Press, 2002.
3	Internal radiation exposure	• Part 2: pages 60-71 & 80-85, Part 3: pages 167-175, Part 5: pages 342-346 in: Shapiro, Jacob. Radiation Protection: A Guide for Scientists, Regulators, and Physicians. 4th ed., Harvard University Press, 2002.
4	Exposure control	• Part 5: pages 380-383 in: Shapiro, Jacob. Radiation Protection: A Guide for Scientists, Regulators, and Physicians. 4th ed., Harvard University Press, 2002. • View three Harborview Research and Training videos (links on Canvas site)
5	Measurement demo/lab	• Part 4: page 250-321 in: Shapiro, Jacob. Radiation Protection: A Guide for Scientists, Regulators, and Physicians. 4th ed., Harvard University Press, 2002. • Assignment 2: Problem set/lab (ionizing radiation)
MODULE 2: Non-Ionizing Radiation		
6	Non-ionizing radiation - Intro	• Chapter 11 (Nonionizing Radiation), Yost.
7	Optical laser and ELF	• No additional reading
8	Non-ionizing radiation demo/lab	• Demo/lab
MODULE 3: Noise		
9	Noise - Intro	• Chapter 1 (Noise Control and Hearing Conservation: Why Do It?) in: Berger, Elliott H., and American Industrial Hygiene Association. The Noise Manual. Revised fifth ed., American Industrial Hygiene Association, 2003.

10	Noise - Measurement	• Lamancusa, Noise Control: Instrumentation for noise measurements, pgs. 1-18.
11	Noise - Control	• Chapter 9 (Noise Control Engineering) in: Berger, Elliott H., and American Industrial Hygiene Association. The Noise Manual. Revised fifth ed., American Industrial Hygiene Association, 2003.
12	Noise – Hearing loss prevention programs	• Neitzel, Richard, and Seixas, Noah. "The Effectiveness of Hearing Protection Among Construction Workers." Journal of Occupational and Environmental Hygiene, vol. 2, no. 4, 2005, pp. 227–238.
13	Noise Lab	• Assignment 3: Problem set/lab (noise)
MODULE 4: Ergonomics		
14	Ergonomics – Lower back	• Chapter 30 (Ergonomics) in: Anna, Daniel H., and American Industrial Hygiene Association. The Occupational Environment: Its Evaluation, Control and Management. 3rd ed., American Industrial Hygiene Association, 2011.
15	Ergonomics – Upper extremities	• Chapter 32 (Upper Extremities) in: Anna, Daniel H., and American Industrial Hygiene Association. The Occupational Environment: Its Evaluation, Control and Management. 3rd ed., American Industrial Hygiene Association, 2011. • Watch two videos posted on Canvas site.
16	Ergonomics tools	• Assignment 3: Problem set/lab (ergonomics)
MODULE 5: Thermal Stress		
18	Thermal stress - Intro	• Chapter 12 (Thermal Stress) in: Plog, Barbara A., and Quinlan, Patricia. Fundamentals of Industrial Hygiene. 5th ed., National Safety Council Press, 2002.
19	Thermal stress - Assessment and control	• Chapter 28 (Thermal Standards and Measurement Techniques) in: Anna, Daniel H., and American Industrial Hygiene Association. The Occupational Environment: Its Evaluation, Control and Management. 3rd ed., American Industrial Hygiene Association, 2011.
Extra Session		
20	Tour of CENPA	•
EXAMS		
	Final Exam	• Due June 7

Respiratory Illness - Protocols and Safety (updated for spring quarter 2023)

Winter quarter is a time of increased risk of acquiring respiratory illnesses including COVID, RSV, cold, and flu.

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.

Please check your email 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 with a Zoom link for remote instruction or a plan for making up the class.

Additional recommendations include:

1. Get boosted with the updated COVID-19 vaccines. These vaccines are available at clinics and pharmacies, as well as through UW Medicine and local health agencies.
2. Get your annual flu shot.
3. Wear a high-quality mask in indoor public spaces and while traveling. Masks are strongly recommended the first two weeks of winter quarter. High-quality masks help protect against a range of respiratory viruses, and are available for free in locations on each UW campus.
4. Take a coronavirus test if you have symptoms or have been exposed. Rapid antigen tests are widely available for free in at campus locations listed here. The Husky Coronavirus Testing voluntary research study is also available for UW students.
5. Activate WA Notify on your phone to receive exposure notifications and so that you can anonymously let others know of their exposure if you test positive.

ACCESS AND 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 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 (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.

Artificial Intelligence (AI)

Do not use AI to write your assignments, unless you are specifically told that it is allowed. You can use AI to help with the research, but you will need to have appropriate references. When using AI, you are a co-author, but we want you to be the sole author, no co-creation of your assignments. The purpose of you taking this course is for you to learn the content, not to get a passing grade (though you will probably get that as well). Learning involves intellectual struggle and happens when you do the work. AI gives an answer, right or wrong, but it comes across as the truth and can use hallucinations (making up references or uses citations that are not real). Students need to be critical consumers of the content.

Statement on Inclusion and Diversity

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, all are expected:

- To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
- To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
- To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.

Learning Environment:

The Department of Environmental and Occupational Health Sciences (DEOHS) strives to create welcoming and respectful learning environments that promote access and opportunity for all students, regardless of their experiences, perspectives, identities, and abilities. The DEOHS, along with The UW School of Public Health, seek to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. Students are encouraged to talk to

instructors, advisors, members of the departmental or SPH Diversity Committee and/or program director with concerns about the classroom climate.

If you feel like this class is not living up to that commitment, there are several ways you can register your concern and seek resolution:

- If you feel comfortable doing so, begin by discussing your concern with the instructor and/or teaching assistant. Your instructor is expected to take your concerns seriously and work with you to identify a resolution.
- If you are not comfortable discussing the concern with the instructor, or you did so and the issue has still not been resolved, contact Trina Sterry, DEOHS Manager of Student and Academic Services (tsterry@uw.edu) to discuss your concern. She can also connect you to the appropriate member of DEOHS faculty leadership as needed.
- If you prefer to discuss your concern directly with someone from the School of Public Health (SPH) Dean's Office, you can review the SPH Student Concern Policy and follow the procedures described there, including reaching out to the SPH Assistant Dean for Equity, Diversity and Inclusion, Dr. Victoria Gardner (vg@uw.edu). If you prefer to anonymously report your concern, you can email dcinfo@uw.edu or use the SPH Bias Incident Report Form.
- If your concern is related to a bias incident, you can review the UW's guidance on reporting bias incidents, which includes a link to the UW Bias Reporting Tool.
- If you have experienced sex or gender discrimination, including sexual assault, relationship or intimate partner violence, stalking, sexual harassment, or other sexual misconduct, you have the right to make a formal complaint and request an investigation under Title IX. Information about Title IX reporting options is available at https://www.washington.edu/titleix/report/. The University also has other designated offices to help you avoid and/or report sexual harassment: SafeCampus (https://www.washington.edu/safecampus/); Office of the Ombud (https://www.washington.edu/ombud/); and University Complaint Investigation and Resolution Office (https://www.washington.edu/uciro/).

Safety: Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus's team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

Statement on Classroom Climate: We are co-creators of our learning environment. It is our collective responsibility to develop a supportive learning environment for everyone. Listening with respect and an open mind, striving to understand others' views, and articulating your own point of view will help foster the creation of this environment. We engage our differences with the intent to build community, not to put down the other and distance our self from the other. Being mindful to not monopolize discussion and/or interrupt others will also help foster a dialogic environment.

The following guidelines can add to the richness of our discussion:

- We assume that persons are always doing the best that they can, including the persons in this learning environment.
- We acknowledge that systematic oppression exists based on privileged positions and specific to race, gender, class, religion, sexual orientation, and other social variables and identities.
- We posit that assigning blame to persons in socially marginal positions is counter-productive to our practice. We can learn much about the dominant culture by looking at how it constructs the lives of those on its social margins.
- While we may question or take issue with another class member's ideology, we will not demean, devalue, or attempt to humiliate another person based on her/his experiences, value system, or construction of meaning.
- We have a professional obligation to actively challenge myths and stereotypes about our own groups and other groups so we can break down the walls that prohibit group cooperation and growth.
  [Adapted from Lynn Weber Cannon (1990). Fostering positive race, class and gender dynamics in the classroom. *Women Studies Quarterly, 1 & 2, 126-134*.]

We are a learning community. As such, we are expected to engage with difference. Part of functioning as a learning community is to engage in dialogue in respectful ways that supports learning for all of us and that holds us accountable to each other. Our learning community asks us to trust and take risks in being vulnerable.

Here are some guidelines that we try to use in our learning process:

- LISTEN WELL and be present to each member of our group and class.
- Assume that I might miss things others see and see things others miss.
- Raise my views in such a way that I encourage others to raise theirs.
- Inquire into others' views while inviting them to inquire into mine.
- Extend the same listening to others I would wish them to extend to me.
- Surface my feelings in such a way that I make it easier for others to surface theirs.
- Regard my views as a perspective onto the world, not the world itself.
- Beware of either-or thinking.
- Beware of my assumptions of others and their motivations.
- Test my assumptions about how and why people say or do things.
- Be authentic in my engagement with all members of our class.

COUNCIL ON EDUCATION FOR PUBLIC HEALTH (CEPH) COMPETENCIES

The School of Public Health (SPH) is accredited by the Council on Education for Public Health (CEPH). Students in Occupational Hygiene and MPH in Environmental and Occupational Health programs will meet the following degree competency(s) in this course, and will be assessed as

indicated. For additional information on the 2020 SPH CEPH accreditation please visit the SPH's CEPH Accreditation webpage.

"Identify and characterize health hazards associated with exposures in the workplace"

Pronouns: We share our pronouns because we strive to cultivate an inclusive environment where people of all genders feel safe and respected. We cannot assume we know someone's gender just by looking at them. So we invite everyone to share their pronouns.

Land Acknowledgment: *"The University of Washington acknowledges the Coast Salish peopleof this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations."*