

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

Quarter: Spring 2022

Credits & Grading: 3 credits, graded

Days/Times: Tuesday and Thursday, 1:30 to 2:50

Location: Tuesday - South Campus Center 350

Thursday - South Campus Center 346

Final: Due Friday, June 10, 2022, no class meeting

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

#	Date	Module	Topic	Instructor
1	29-Mar	Introduction		Cohen
2	31-Mar	Thermal Stress	Introduction	Cohen
3	5-Apr	Thermal Stress	Assessment & Control	Cohen
4	7-Apr	Heat Stress Lab	Demo/Lab (no assignment)	Cohen
5	12-Apr	Ionizing Radiation	Fundamentals and external radiation protection dosimetry	Campbell
6	14-Apr	Ionizing Radiation	Radiation protection, dosimetry, internal exposures, radionuclides	Campbell
7	19-Apr	Ionizing Radiation	Protection standards, regulations, waste, and instruments	Campbell
8	21-Apr	Ionizing Radiation	Measurement demonstration	Makinson
9	26-Apr	Germicidal UV		Linden
10	28-Apr	Noise	Introduction	Croteau
11	3-May	Noise	Measurement	Croteau
12	5-May	Noise	Noise Control	Croteau
13	10-May	Noise	Hearing loss prevention programs	Cohen
14	12-May	Noise	Measurement and controls lab	Cohen
15	17-May	WMSD	L1 - Lower back	Spielholz
16	19-May	WMSD	L2 - Upper extremities	Spielholz
17	24-May	WMSD	Lab (ergo tools)	Spielholz
18	26-May	Non-ionizing Radiation	Part 1	Yost
19	31-May	Non-ionizing Radiation	Part 2	Yost
20	2-Jun	Non-ionizing Radiation	NIR Lab	Yost
21	10-Jun	Final due		

Session	Topic	Readings/Assignments
Course Introduction		
1	Course overview and introduction	<ul style="list-style-type: none"> Haddon, William. "Advances in the Epidemiology of Injuries as a Basis for Public Policy." <i>Public Health Reports</i> (1974), vol. 95, no. 5, 1980, pp. 411–421. Wertheimer, N, and Leeper, E. "Electrical Wiring Configurations and Childhood Cancer." <i>American Journal of Epidemiology</i>, vol. 109, no. 3, 1979, pp. 273–284.
MODULE 1: Thermal Stress		
2	Thermal stress - Intro	<ul style="list-style-type: none"> Chapter 12 (Thermal Stress) in: Plog, Barbara A., and Quinlan, Patricia. <i>Fundamentals of Industrial Hygiene</i>. 5th ed., National Safety Council Press, 2002.
3	Thermal stress - Assessment and control	<ul style="list-style-type: none"> Chapter 28 (Thermal Standards and Measurement Techniques) in: Anna, Daniel H., and American Industrial Hygiene Association. <i>The Occupational Environment: Its Evaluation, Control and Management</i>. 3rd ed., American Industrial Hygiene Association, 2011.
4	Thermal stress demo/lab	<ul style="list-style-type: none"> Be prepared to do thermal balance calculations
MODULE 2: Ionizing Radiation		
5	External radiation exposures	<ul style="list-style-type: none"> 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. <i>Radiation Protection: A Guide for Scientists, Regulators, and Physicians</i>. 4th ed., Harvard University Press, 2002.
6	Internal radiation exposure	<ul style="list-style-type: none"> Part 2: pages 60-71 & 80-85, Part 3: pages 167-175, Part 5: pages 342-346 in: Shapiro, Jacob. <i>Radiation Protection: A Guide for Scientists, Regulators, and Physicians</i>. 4th ed., Harvard University Press, 2002.
7	Exposure control	<ul style="list-style-type: none"> Part 5: pages 380-383 in: Shapiro, Jacob. <i>Radiation Protection: A Guide for Scientists, Regulators, and Physicians</i>. 4th ed., Harvard University Press, 2002. View three Harborview Research and Training videos (links on Canvas site)
8	Measurement	<ul style="list-style-type: none"> Part 4: page 250-321 in: Shapiro, Jacob. <i>Radiation Protection: A Guide for Scientists, Regulators, and Physicians</i>. 4th ed., Harvard University Press, 2002. Assignment 2: Problem set/lab (ionizing radiation)
MODULE 5a: Non-Ionizing Radiation (Germicidal UV)		
9	Germicidal UV	<ul style="list-style-type: none"> TBA

MODULE 3: Noise		
10	Noise - Intro	<ul style="list-style-type: none"> 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.
11	Noise - Measurement	<ul style="list-style-type: none"> Lamancusa, Noise Control: Instrumentation for noise measurements, pgs. 1-18.
12	Noise - Control	<ul style="list-style-type: none"> 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.
13	Noise – Hearing loss prevention programs	<ul style="list-style-type: none"> 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.
14	Noise	<ul style="list-style-type: none"> Assignment 3: Problem set/lab (noise)
MODULE 4: Ergonomics		
15	Ergonomics – Lower back	<ul style="list-style-type: none"> 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.
16	Ergonomics – Upper extremities	<ul style="list-style-type: none"> 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.
17	Ergonomics	<ul style="list-style-type: none"> Assignment 3: Problem set/lab (ergonomics)
MODULE 5: Non-ionizing Radiation		
18	Non-ionizing radiation - Intro	<ul style="list-style-type: none"> Chapter 11 (Nonionizing Radiation), Yost.
19	Optical laser and ELF	<ul style="list-style-type: none"> No additional reading
20	Non-ionizing radiation	<ul style="list-style-type: none"> Assignment 1: Problem set/lab (non-ionizing radiation)
EXAMS		
	Final Exam	<ul style="list-style-type: none"> Due June 10

COVID-19 policy: We will be following the UW’s COVID-19 policy and [requiring the use of appropriate masks](#) indoors.

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.

COVID-Related Expectations: Per UW policy, this class will be conducted in person. Therefore, unless you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by the SPH Office of the Dean that allows you to take the course remotely [[see student communications here](#)] you should only register for this class if you can attend in-person.

- Please contact UW Disability Resources for Students (DRS) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.
- If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter. If you have questions about this type of arrangement, please reach out to Student and Academic Services by email at sphas@uw.edu.

All UW students are expected to complete their [vaccine attestation](#) before arriving on campus and to follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or [campus policy](#), you are responsible for notifying your instructors as soon as possible by email. **If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing covidehc@uw.edu or calling 206-626-3344.**

Food is not allowed in the classroom. Drinks may be sipped with lifting or removal of your facemask for a brief moment, and immediate re-masking after drinking.

Please check your email daily BEFORE coming to class. If we need to conduct class remotely because the instructor or a guest speaker is complying with UW policies and unable to attend in person, we will send all registered students an email with a Zoom link for remote instruction. Thank you for your patience and support as we all transition together back to in-person learning!

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, we are expected:

1. To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender identity and expression, citizenship and immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
2. 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.

On our first day of class we will create ground rules together to follow in promoting a productive learning environment for all members of the class. We are committed to making this class an equitable learning environment. Please talk with us right away if you experience disrespect in this class from other students and/or from us, and we will work to address it in an educational manner.

Reporting Learning Environment Concerns: The Office of the Dean has a student concern policy, a faculty concern policy and standard HR procedures for staff concerns. Students are encouraged to report any incidents of bias in any of the following ways:

- Report the incident to someone they feel comfortable with (including teaching staff, adviser or department staff) or directly inform the SPH Assistant Dean for Equity, Diversity & Inclusion Dr. Victoria Gardner at vg@uw.edu.
- Email dcinfo@uw.edu to file a non-anonymous, confidential report (tracked by Director of Student and Academic Services and Assistant Dean of Equity, Diversity & Inclusion) or
- Send an anonymous and confidential report using the bias concern form [here](#). Report is received by the Assistant Dean for EDI and the Director of Program Operations for Student and Academic Services and tracked for investigation and/or resolution. Reporter can remain completely anonymous but will not receive a response.

Access and Accommodations: The UW Disability Resource team has provided the following statement for the syllabus:

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 \(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](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 \(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/).”

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.

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 people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations."