**ENV H 557A: Exposure Controls**

Quarter: Winter 2025

Credits & Grading: 4 graded credits

**Times and Locations:**  
In person  
Tuesdays, 2:30-4:20pm: [HSEB 421](https://www.washington.edu/maps/#!/HSEB) unless specified in the schedule for a lab session\*  
Thursdays, 2:30-3:20pm: [HSEB 421](https://www.washington.edu/maps/#!/HSEB) unless specified in the schedule for a lab session\*  
\*Sessions held in the [Roosevelt One Building](https://www.washington.edu/maps/#!/ott) DEOHS laboratory will be specified ahead of time

**Instructor**

Dr. Diana Ceballos (she/her), Assistant Professor

Office: 150-B, Roosevelt One Building

Email: dmco25@uw.edu

Phone: 206-897-1979

Office Hours: Fridays at 9am over Zoom (unless the class votes for another time). Email Dr. Ceballos ahead of joining.

Join Zoom Meeting:

<https://washington.zoom.us/j/92741897248>

Meeting ID: 927 4189 7248

Notes:

* + If office hours do not work with your schedule, then you can make an appointment by contacting Ms. Stella Christoforou at [stellac8@uw.edu](mailto:stellac8@uw.edu) to set up a 15min zoom meeting. Besides, I'm generally available during class, right after class, and office hours for discussions, including ENVH 557 homework. If Stella has not answered your email after a workday, feel free to reach out to me and cc her as follow up.
  + I aim to respond class inquiries within a workday, but please understand that I may not be available during evenings or weekends.

**\*\*\*\*Disclaimer:** This syllabus will be updated regularly, and the updated syllabus will be posted on the Canvas site. Changes may include any part of the syllabus, including modules, readings, and assignments**\*\*\*\***

**Course Description**

This course presents the engineering principles for selecting and designing exposure controls to protect people from chemical, physical, and biological agents. The course is intended for graduate students in exposure sciences, occupational health, engineering, and environmental health. The class is broadly organized around modules on the hierarchy of controls and points of control applied to sources, pathways, and receptors. Case study exercises illustrate the application of control techniques in real situations and integrate the various approaches from the lecture material.

The extended content session on ventilation provides more in-depth material on using local exhaust ventilation (LEV) for source controls, particularly in occupational settings. These extra sessions introduce students to other ventilation essential concepts such as hoods, air cleaners, fans, etc.

Students will complete laboratory exercises to learn:

1. The use of box models to understand ventilation dynamics in a room.
2. How to perform a ventilation inspection at a workplace.
3. How to do measurements in a one/two-branch ventilation system.

**Course Learning Outcomes**

After this course, students will be able to:

1. Understand hazard ranking and banding strategies for workplace exposure scenarios

2. Name Federal and State regulation authorities and requirements related to human exposures

3. Compute exposure estimates for indoor air quality assuming well-mixed room models

4. Describe HVAC components used for indoor air quality and infection control

5. Assess the airflow characteristics of a ventilation system and apply this data for system diagnostics

6. Select the appropriate type of local exhaust hood for controlling workplace exposures

7. Describe the criteria for selecting chemical or biological protective clothing

8. Describe criteria for selecting protective equipment for physical agents such as noise

9. List the elements and evaluation of a comprehensive respiratory protection program

10. Get familiarized with hazard communication in the workplace

**Additional Ventilation Section Learning Objectives:**

1. Understand principles of the flow of air or liquids in building ducting and piping systems

2. Get familiarized with dilution ventilation situations

3. Learn the steps needed in a workplace ventilation inspection

4. Describe the components of a single-branch and two-branch local exhaust ventilation system

5. Learn how to make fluid measurements of pressure drop, flow rate, and velocity

6. Calculate basic ventilation estimates typically needed in workplaces

**Required Textbook and Readings**

Books will be available on reserve at the Health Sciences library:

* McDermott H, **Handbook of Ventilation for Contamination Control** ACGIH Publications 2001
* American Conference of Governmental Industrial Hygienists. Committee on Industrial Ventilation. (2001). **Industrial Ventilation: A Manual of Recommended Practice**. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists.

**Good Resource for Industrial Hygiene Equations**

* Industrial-Occupational Calculations: A Professional Reference. Book by James H. Stewart, Martin Horowitz, and Robert F. Herrick. ISBN 10: 096719346X, ISBN 13: 9780967193465. Publisher: Millennium Associates, 2017.

**Grading & Assessment**

Detailed information about each of the assignment components, expectations, and grading criteria (rubric, if any) will be included on the Canvas site. Your grade will consist of homework and laboratories (A-G), and a final project group presentation (F, H). Always submit your assignments via the Canvas site and name the files on your assignments with easily identifiable information, ideally at a minimum, denoting the assignment letter and your name. For example: "Assignment\_B\_Diana\_Ceballos."

Weekly reading assignments will be posted on the Canvas website.

Students are responsible for submitting assignments on time and for class readings.

**Very important**: Please bring homework progress to class in case there are any questions or discussion related to the homework.

**The final grade consists of the following components:**

* Assignments go from A1 through H2 (16 total assignments), possibly more.
* Each assignment/lab is graded with 25 points. 16 assignments X 25points = 400 points = 4.0 grade. Progress submissions are graded credit/no credit if submission is showing genuine progress expected per assignment. Other assignments will be graded up to 25 points.
  + All assignments related to the final project, along with the final presentation (A1, A2, F, H1, and H2) total 125 points for 31% of the grade. Specifically, the final project oral presentation accounts for 12.5% of the grade (H1: individual presentation 25 points + H2: group presentation 25 points).
  + 3 Homework & 2-3 lab reports (unrelated to the final project) account for the rest of the grade, 69%.

**Late Assignment Policy**

All assignments should be submitted via the Assignments tool on the Canvas site by midnight of the due date (the day of class, unless otherwise specified), with clear labeling including the student's name, date, and assignment name/number/type.

Late assignments will be docked 20% of their value per day and will not be accepted after five days past the deadline. Students will need to request an extension in writing ahead of the due date, if possible. Exceptions will be rare and only granted under extreme extenuating or justifiable circumstances.

\*Assignments are due midnight after class unless specified (e.g., in-class presentations).

**Excused Absence from Class**

Students are expected to attend class and participate in all graded activities.

Classes will be recorded with Zoom and posted in the course canvas. The instructor will do their best to record video and audio of each class. However, the instructor cannot guarantee the quality of the recordings or that every class will be properly recorded. Students who missed class in person are expected to watch the online recording and check Canvas to ensure they are up to date on homework.

A student anticipating being absent from class due to a Religious Accommodation activity needs to complete the Religious Accommodations request process by the second Friday of the quarter. Students who anticipate missing class due to attendance at academic conferences, field trips, or participation in university-sponsored activities should provide a written notice to the instructor before the absence. The instructor will determine if the graded activity can be rescheduled or if there is equivalent work that can be done, as determined by the instructor.

To protect student privacy and the integrity of the academic experience, students will not be required to provide a medical excuse note to justify an absence from class due to illness. A student absent from any graded class activity due to illness must request, in writing, to take a rescheduled assignment or perform work judged by the instructor to be equivalent.

**Session-by-Session ENVH 557 Exposure Controls Winter 2025 Schedule**

Tuesdays 2:30 to 4:20 PM & Thursdays 2:30 to 3:20 PM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Room** | **Activity: Topics** | **Assignments** |
|  |  |  | **1 – Introduction to Control Strategies** |  |
| 1 | Tues. 1/7 | HSEB 421 | Introductions, Syllabus, & Description Final Project (Case Studies)  Introduction to Exposure Control |  |
| 2 | Thurs 1/9 |  | No class – Cascadia 2025 conference |  |
|  |  |  | **2 – Elimination and Substitution Controls** |  |
| **3** | Tues 1/14 | HSEB 421 | Regulatory Mandates  **Group Work Session** to form groups for final project  Chemical Management, Substitution, & Finding Safer Alternatives | A1: Submit 3 ideas for final project |
|  |  |  | **3 – Engineering Controls: General Room Ventilation** |  |
| **4** | Thurs 1/16 | Roos Fish Bowl | **Group Work Session** to form groups for final project  Introduction to Ventilation Systems  **Lab 1:** Dilution Ventilation Principals (one box model) |  |
| **5** | Tues 1/21 | HSEB 421 | Principals of Contaminants Dilution Calculations Introduction to Dilution Ventilation and one box model  **Group Exercise**: Using box models for ventilation dilution calculation | A2: Submit final idea final project  B1: Submit lab 1 report progress |
|  |  |  | **4---Engineering Controls: Principles in LEV Ventilation** |  |
| **6** | Thurs 1/23 | HSEB 421 | Basics on Single and Multi-Branch Ventilation Systems (MY) Ventilation Accessories Fundamentals (MY) |  |
| **7** | Tues 1/28 | Roos Field Group Lab | **Lab 2 (MC):** Workplace Inspections & Checks on Ventilation | B2: Submit lab 1 report finalized |
|  |  |  | **5&6—Engineering Controls: Practical Applications** |  |
| **8** | Thurs 1/30 | Roos Fish Bowl | Basics on Density, Viscosity, Pressure, Flow, & Fluid Dynamics  In-Class Demo: Overview of Fluid Concepts using a Vacuum Cleaner **Group Exercise:** Inspections & ventilation lab 2 problems discussion | C1: Submit lab 2 progress |
| **9** | Tues 2/4 | Roos Field Group Lab | **Lab 3 (MB):** Exercise Measurements in Ventilation Systems |  |
| **10** | Thurs 2/6 | HSEB 421 | Control Banding  **Group Discussion**: Control Banding in Different Industries **Group Exercise:** Pressure & Flow Calculations using Lab Data | C2: Submit lab 2 final  D1: Submit lab 3 1st-part report progress |
| **11** | Tues 2/11 | HSEB 421 | Indoor Air Quality and Ventilation **Case Studies Discussion**: Office vs. School IAQ Investigations **Group Exercise:** Calculating ACH in a Classroom part 1 **Group Discussion:** Hood Calculations using Lab Data | D2: Submit lab 3 2nd-part report progress |
|  |  |  | **7&8- Integrated Controls in Industrial & Non-Industrial Settings** |  |
| **12** | Thurs 2/13 | HSEB 421 | Administrative Controls **Group Discussion:** Dangers of Confined Spaces **Group Exercise:** Calculating ACH in a Classroom part 2 Group Work Session on final project |  |
| **13** | Tues 2/18 |  | Controls for Physical Agents (MY) | D3: Submit lab 3 report final |
| **14** | Thurs  2/20 | HSEB 421 | **Group Work Session** (final projects & homework)  Admin Controls (Confined space case study) | E1: Submit homework calculations progress |
| **15** | Tues 2/25 | HSEB 421 | **Video Tour**: Roosevelt One Building HVAC System (MC)  Introduction to PPE **Group Discussion:** Choosing the right PPE | E2: Submit homework calculations final |
|  |  |  | **9- Personal Protective Equipment** |  |
| **16** | Thurs 2/27 | Roos Fish Bowl & Lab | **In-class Demo:** PPE Selection, Uses, and Fit Testing  **Group Work Session** | F: Submit final project update (individual) |
| **17** | Tues  3/4 | Roos field group lap | **Guest discussion** about controls in healthcare and research with Liz Kindred (EH&S Director at the Fred Hutch & Alliances)  **Group Discussion**: Calculating Respirator Protection Factors  **Group Work Session** (final projects & homework) | G1: Submit PPE homework progress |
|  |  |  | **10 – Wrap up and Group Presentations** |  |
| **18** | Thurs 3/6 | HSEB 421 | **Tour (TBD):** Rosling Building HVAC System  **Group Discussion:** Exploring other Personal Protective Equipment  In Class work in groups (final projects & homework) | G2: Submit PPE homework final |
| **19** | Tues 3/11 | HSEB 421 | **Group Presentations** |  |
| **20** | Thurs 3/13 | HSEB 421 | **Group Presentations** |  |
|  |  |  | **No class & no exam – Finals week March 15-21** |  |

**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/) (<https://registrar.washington.edu/students/religious-accommodations-request/>).

**Respiratory Illness - Protocols and Safety**

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](https://www.washington.edu/coronavirus/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](https://wellbeing.uw.edu/flu-vaccination/).
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](https://www.washington.edu/coronavirus/student-faq/#freemasks).
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](https://www.washington.edu/coronavirus/testing/). The [Husky Coronavirus Testing](https://www.washington.edu/coronavirus/testing/hct/) voluntary research study is also available for UW students.

**Access & 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](https://depts.washington.edu/uwdrs/).

**Academic Integrity**

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

In this course, collaborative group work is encouraged, especially during laboratories and the final project. However, it is essential to note that lab reports must be submitted individually. While collaborative learning is valuable, it is imperative that each student submits original work, particularly in the context of individual assignments. Please ensure that all calculations and explanations are your own.

Furthermore, kindly refrain from seeking external shortcuts or assistance, such as using search engines like Google or artificial intelligence tools, for assignments and lab reports. Our class discussions, along with provided materials and resources, are designed to address any questions you may have. If you choose to consult external sources to enhance your understanding of the material, it is crucial that you express the concepts in your own words, demonstrating your ability to apply them to the specific context of the assignment. Assignments will receive no points if information is copy-pasted from any source. Depending on the circumstances surrounding the use of external sources, you may be referred to the academic integrity office after a discussion about your work. Failure to engage in a discussion about any of these issues may result in an incomplete grade.

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](https://www.washington.edu/studentconduct/) (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and [the SPH Academic Integrity Policy](https://sph.washington.edu/students/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.

**Writing Skills**

Effective communication through writing is an important transferable skill for all career pathways. Establishing a strong foundation in writing skills will help you be successful throughout your future course work and career. This course includes written assignments with the goal of helping you get feedback on and improve your writing skills. If, however, you feel that you could benefit from additional resources to improve you writing skills, a list of UW and other online resources can be found on the SPH website (<https://sph.washington.edu/sites/default/files/inline-files/Writing-Resources-4.3.19.pdf>) and on the DEOHS intranet (<https://portal.deohs.washington.edu/index.php/academic-support-writing-resources> - accessible only to DEOHS students).

**Land Acknowledgement**

Washington state is home to 29 federally recognized and multiple unrecognized tribes. We include a land acknowledgment statement as a sign of respect for the original caretakers of the land: “We acknowledge 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."

**Equity, Diversity & Inclusion**

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

**Pronouns**

The University of Washington supports the expression of all gender identity, and provides frequently asked question on pronouns at the following link: <https://registrar.washington.edu/students/personal-data/pronouns/faqs/>. UW staff, faculty, and students can now also set their pronouns in the Identity. UW system to make them automatically available in Canvas and other UW systems (see <https://itconnect.uw.edu/guides-by-topic/identity-diversity-inclusion/identity/pronouns>).

**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](mailto: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](https://sph.washington.edu/students/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](mailto:vg@uw.edu)). If you prefer to anonymously report your concern, you can email [dcinfo@uw.edu](mailto:dcinfo@uw.edu) or use [the SPH Bias Incident Report Form](mailto:https://sph.washington.edu/about/diversity/bias-concerns).
* If your concern is related to a bias incident, you can review [the UW’s guidance on reporting bias incidents](https://www.washington.edu/bias/), 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/>).