# Course Syllabus

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## Course Description

This course presents the engineering principles of selecting and designing exposure controls to protect people from chemical physical and biological agents. The course is intended for graduate students in exposure assessment, occupational health, engineering, and environmental health. The class is broadly organized around modules on the concepts of source controls, pathway controls and receptor controls. A series of case study exercises by members of the class is designed to illustrate the application of exposure control techniques in real situations, and integrate the various approaches from the lecture material.

An extended content session (1hr/week, 1 credit) provides in-depth material related to the use of local exhaust ventilation (LEV) for source control in occupational settings. This session expands content on hood selection, and includes new material on duct system design, air cleaners and fan selection necessary for workplace ventilation. Students will complete an assignment in which they design a two-branch ventilation system. Students in the regular section (3 credits) receive instruction in the applications of local exhaust hoods for source control, but not in the design of LEV systems.

## Learning Objectives

At the conclusion of this course, students will be able to:

1. Apply hazard ranking and banding strategies to workplace and environmental exposure scenarios
2. Name Federal and State regulation authorities and requirements related to human exposures
3. Compute exposure estimates for well-mixed rooms involving dilution ventilation and constant inputs
4. Describe the function of HVAC components used for building ventilation
5. Describe the role of HVAC in indoor air quality and infection control for health care settings
6. Measure the flow characteristics of a ventilation system and apply this data for system diagnostics
7. Select the appropriate type of local exhaust hood for controlling workplace exposures
8. Describe criteria for selecting chemical or biological protective clothing
9. Describe criteria for selecting protective equipment for physical agents such as noise of laser light
10. Describe the criteria for specifying respiratory protection based on appropriate protection factors
11. List the elements and evaluation of a comprehensive respiratory protection program
12. Describe the inventory control and chemical hygiene requirements for hazardous materials

**Additional Ventilation Section Learning Objectives:**

1. Compute exposure estimates for a dilution ventilation situation with variable input conditions.
2. Explain principles of fluid mechanics that apply to flow of air or liquids in building ducting and piping systems; describe fluid measurements in terms of pressure drop, flow rate, and velocity.
3. Estimate friction losses for flow through ducts or pipes using standard tables.
4. Design and specify the components of a single-branch local exhaust ventilation system.
5. Design and specify the components of a multiple branch local exhaust ventilation system.

## Textbooks & Study Resources

- Woodside, G., & Kocurek, Dianna S. (1997). **Environmental, Safety, and Health Engineering**. New York: Wiley. ISBN: 0471109320. (Contains principles of environmental engineering, safety engineering and industrial hygiene/occupational health engineering.)
- McDermot H, **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** (24th ed.). Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists.
- Genium Publishing Corporation. (1995). **Personal Protective Equipment Pocket Guide**. ISBN: 0-931690-73-0. (This employee guidebook explains OSHA's personal protective equipment standard and how to comply. It also includes forms employees can use to document their comprehension of their PPE responsibilities.)
- Genium Publishing Corporation. (1995). **Respirator Pocket Guide**. ISBN: 0-931690-81-1. (This guide explains and helps workers understand the importance of regulatory issues, how respirators are designed to handle differing airborne hazards, and details basic equipment use and maintenance.)
- **OSHA Publication 3151, Personal Protective Equipment.** (Revised 2004).
- **OSHA publication #3079, Respiratory Protection**. (Revised 2002)
- **OSHA Small Entity Compliance Guide for Respiratory Protection Standard** (CFR 1910.134).

## Course Grading Policy

Weekly reading assignments will be posted on the website and announced in class.

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

Assigned discussions will be graded for content and participation.

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

- Assignments (4) = 60%
- Lab exercise reports = 25%
- Class project/presentation = 15%

## Classroom Climate

The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director.

## Access and Accommodations

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs 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), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or **disability.uw.edu** (http://depts.washington.edu/uwdrs/). DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

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** (http://sph.washington.edu/students/academicintegrity/). 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.

# Course Summary:

| Date | Details | |
|---|---|---|
| Mon Jan 6, 2020 | **Hazard Ranking & Hierarchy of Controls** (https://canvas.uw.edu/courses/1375952/assignments/5093147) | due by 1:30pm |
| Wed Jan 8, 2020 | **Regulatory Mandates & Requirements; Chemical/Material Safety Management** (https://canvas.uw.edu/courses/1375952/assignments/5093148) | due by 1:30pm |
| Mon Jan 13, 2020 | **Substitution/Green Chemistry: finding safer alternatives** (https://canvas.uw.edu/courses/1375952/assignments/5093143) | due by 1:30pm |
| Wed Jan 15, 2020 | **Chemical & Biological Agents; Chemical Protective Clothing** (https://canvas.uw.edu/courses/1375952/assignments/5093142) | due by 1:30pm |

| Date | Details | |
|---|---|---|
| Wed Jan 22, 2020 | Fluid Mechanics Primer: Density, Viscosity & Fluid Dynamics (https://canvas.uw.edu/courses/1375952/assignments/5093144) | due by 1:30pm |
| Fri Jan 24, 2020 | Assignment 1 - PPE Selection (https://canvas.uw.edu/courses/1375952/assignments/5093151) | due by 11:59pm |
| Mon Jan 27, 2020 | Bernoulli Equation; Essential Pressure & Flow Relationships (https://canvas.uw.edu/courses/1375952/assignments/5093145) | due by 1:30pm |
| Tue Jan 28, 2020 | Assignment 2 - Substitution (https://canvas.uw.edu/courses/1375952/assignments/5093152) | due by 11:59pm |
| Wed Jan 29, 2020 | Dilution Ventilation: theory and confined space applications (ROOSEVELT) (https://canvas.uw.edu/courses/1375952/assignments/5093149) | due by 1:30pm |
| Mon Feb 3, 2020 | Lab Exercise 1 (ROOSEVELT) (https://canvas.uw.edu/courses/1375952/assignments/5093146) | due by 1:30pm |
| Wed Feb 5, 2020 | Hood Design & Entry Effects; Ventilation Assessment and Troubleshooting (https://canvas.uw.edu/courses/1375952/assignments/5093160) | due by 1:30pm |
| Mon Feb 10, 2020 | Single Branch System Design; Multi Branch System Design (https://canvas.uw.edu/courses/1375952/assignments/5093165) | due by 1:30pm |
| | Vent lab exercise #1 - writeup (https://canvas.uw.edu/courses/1375952/assignments/5093166) | due by 11:59pm |
| Wed Feb 12, 2020 | LEV Lab Exercise 2 (meet at Roosevelt Building) (https://canvas.uw.edu/courses/1375952/assignments/5093162) | due by 1:30pm |
| Thu Feb 13, 2020 | Assignment 3 - Dilution Ventilation Problem Set (https://canvas.uw.edu/courses/1375952/assignments/5093153) | due by 11:59pm |
| Wed Feb 19, 2020 | Confined Spaces (https://canvas.uw.edu/courses/1375952/assignments/5164808) | due by 1:30pm |
| Thu Feb 20, 2020 | Assignment 4 - LEV System Design, Segment 1 (https://canvas.uw.edu/courses/1375952/assignments/5093154) | due by 11:59pm |
| Mon Feb 24, 2020 | Air Cleaning Systems; Fan Selection (https://canvas.uw.edu/courses/1375952/assignments/5093150) | due by 1:30pm |
| Tue Feb 25, 2020 | Vent lab exercise #2 - writeup (https://canvas.uw.edu/courses/1375952/assignments/5093167) | due by 11:59pm |

| Date | Details | | |
|---|---|---|---|
| Wed Feb 26, 2020 | | Exposure Controls for Physical Agents (https://canvas.uw.edu/courses/1375952/assignments/5093158) | due by 1:30pm |
| Mon Mar 2, 2020 | | HVAC, Thermal Comfort, IAQ & Plenum Systems (ROOSEVELT) (https://canvas.uw.edu/courses/1375952/assignments/5093161) | due by 1:30pm |
| | | Assignment 4 - LEV System Design, Segment 2 (https://canvas.uw.edu/courses/1375952/assignments/5168299) | due by 11:59pm |
| Wed Mar 4, 2020 | | Respirator Selection & Uses (ROOSEVELT) (https://canvas.uw.edu/courses/1375952/assignments/5093164) | due by 1:30pm |
| | | Respirator Fit Testing & Training (ROOSEVELT) (https://canvas.uw.edu/courses/1375952/assignments/5093163) | due by 2:30pm |
| Mon Mar 9, 2020 | | Field Trip or Inclement Weather Class Make-up (https://canvas.uw.edu/courses/1375952/assignments/5168354) | due by 1:30pm |
| Wed Mar 11, 2020 | | Group Presentation (https://canvas.uw.edu/courses/1375952/assignments/5093159) | due by 1:30pm |
| Tue Mar 17, 2020 | | Assignment 4 - LEV System Design, Segment 3 (https://canvas.uw.edu/courses/1375952/assignments/5168300) | due by 11:59pm |
| | | ENVH 557 Case Study Example (https://canvas.uw.edu/courses/1375952/assignments/5093156) | |
| | | ENVH 557 Case Study Example V2 (https://canvas.uw.edu/courses/1375952/assignments/5093157) | |