# ENV H 557 A: Exposure Controls - Winter 2015

**3 credits, graded, SLN 14303**

**Instructor:**
Michael G Yost, Professor & Department Chair
DEOHS  
Health Sciences Building F-225  
(206) 685-7243  
airion@uw.edu  
Office hours by appointment

**Time:** Mondays + Wednesdays at 1:30p - 3:20p

**Location:** Health Sciences Building T-635

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Class Web Site: https://canvas.uw.edu/courses/975189

Course Description (https://canvas.uw.edu/courses/975189/pages/front-page)  
Class Books (https://canvas.uw.edu/courses/975189/pages/class-books)  
Course Information and Contacts (https://canvas.uw.edu/courses/975189/pages/info-and-class-details)  
Course Learning Objectives (https://canvas.uw.edu/courses/975189/pages/learning-objectives)  
Grade Policy (https://canvas.uw.edu/courses/975189/pages/grading-policy)

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<tr>
<th>Date</th>
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<tbody>
<tr>
<td>Mon Jan 5, 2015</td>
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</table>
**UW Winter Quarter BEGIN** (https://canvas.uw.edu/calendar?event_id=767807&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
Hazard Ranking & Hierarchy of Controls (https://canvas.uw.edu/calendar?event_id=766626&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
UW Winter Quarter BEGIN (https://canvas.uw.edu/calendar?event_id=767807&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
Hazard Ranking & Hierarchy of Controls (https://canvas.uw.edu/calendar?event_id=766626&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d) | 12am  
|                      |   1:30pm to 3:20pm
| Wed Jan 7, 2015     |  
**Regulatory Mandates** (https://canvas.uw.edu/calendar?event_id=766627&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
**Chemical Safety Management** (https://canvas.uw.edu/calendar?event_id=766628&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
**Regulatory Mandates** (https://canvas.uw.edu/calendar?event_id=766627&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)  
**Chemical Safety Management** (https://canvas.uw.edu/calendar?event_id=766628&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d) | 1:30pm to 3:20pm  
|                      | 2:30pm to
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<tr>
<td>Mon Jan 12, 2015</td>
<td>Chemical and Biological Agents (<a href="https://canvas.uw.edu/calendar?event_id=766610&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td>Wed Jan 14, 2015</td>
<td>Fluid Mechanics Primer Part I (<a href="https://canvas.uw.edu/calendar?event_id=766625&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to Fluid Mechanics Primer Part II (<a href="https://canvas.uw.edu/calendar?event_id=766629&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>)</td>
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<td>Mon Jan 19, 2015</td>
<td>UW HOLIDAY - MLK Day (<a href="https://canvas.uw.edu/calendar?event_id=766611&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>)</td>
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<td>Wed Jan 21, 2015</td>
<td>Case Study 1A: Times Beach MO (<a href="https://canvas.uw.edu/calendar?event_id=766630&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to Case Study 1B: Spray Buffers in California (<a href="https://canvas.uw.edu/calendar?event_id=766621&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>)</td>
<td>1:31pm to 3:20pm</td>
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<td>Mon Jan 26, 2015</td>
<td>Hoods &amp; LEV (<a href="https://canvas.uw.edu/calendar?event_id=766622&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to Case Study 2: Confined Spaces (<a href="https://canvas.uw.edu/calendar?event_id=766632&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td>Wed Jan 28, 2015</td>
<td>Dilution Ventilation (Marty Cohen) (<a href="https://canvas.uw.edu/calendar?event_id=766633&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to Discussion of Case Study 1B: Spray Buffers and Pesticide drift (<a href="https://canvas.uw.edu/courses/975189/assignments/2698159">link</a>) due by 5:01pm</td>
<td>1:30pm to 3:20pm</td>
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<td>Fri Jan 30, 2015</td>
<td>Discussion of Case Study 1B: Spray Buffers and Pesticide drift (<a href="https://canvas.uw.edu/courses/975189/assignments/2698159">link</a>) due by 5:01pm</td>
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<tr>
<td>Mon Feb 2, 2015</td>
<td>HVAC, Thermal Comfort, IAQ &amp; Plenum Systems (<a href="https://canvas.uw.edu/calendar?event_id=766634&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to</td>
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<td>Wed Feb 4, 2015</td>
<td>Hood Design &amp; Entry Effects (Gerry Croteau) (<a href="https://canvas.uw.edu/calendar?event_id=766616&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to</td>
<td>1:30pm to 3:20pm</td>
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<td>Thu Feb 5, 2015</td>
<td>Discussion of Case Study 2: Confined Spaces (<a href="https://canvas.uw.edu/courses/975189/assignments/2698158">link</a>) due by 11:59pm</td>
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<td>Mon Feb 9, 2015</td>
<td>Chemical Protective Clothing (<a href="https://canvas.uw.edu/calendar?event_id=766614&amp;include_contexts=course_975189%7b2273686f77223a2267726f75705f636f757273655f393735313839227d">link</a>) to</td>
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<td>Wed Feb 11, 2015</td>
<td><strong>Local Exhaust System: Single Branch System Design</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766624&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766624&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
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<td><strong>Vent Design - Multi Branch Systems</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766618&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766618&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>2:30pm to 3:20pm</td>
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<td>Sun Feb 15, 2015</td>
<td><strong>LEV Design: Single Branch System Homework</strong> (<a href="https://canvas.uw.edu/courses/975189/assignments/2698163">https://canvas.uw.edu/courses/975189/assignments/2698163</a>)</td>
<td>due by 5pm</td>
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<td><strong>Problem Set 1</strong> (<a href="https://canvas.uw.edu/courses/975189/assignments/2698160">https://canvas.uw.edu/courses/975189/assignments/2698160</a>)</td>
<td>due by 5pm</td>
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<td>Mon Feb 16, 2015</td>
<td><strong>UW HOLIDAY - President's Day</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766612&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766612&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>12am</td>
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<td>Wed Feb 18, 2015</td>
<td><strong>Respirator Selection</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766635&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766635&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td><strong>Case Study Assignment Guidelines</strong> (<a href="https://canvas.uw.edu/courses/975189/assignments/2698164">https://canvas.uw.edu/courses/975189/assignments/2698164</a>)</td>
<td>due by 11:59pm</td>
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<tr>
<td>Mon Feb 23, 2015</td>
<td><strong>Airflow Measurements &amp; Troubleshooting (ROOSEVELT BUILDING)</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766613&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766613&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
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<td>Wed Feb 25, 2015</td>
<td><strong>Case Study 3: Respirator Fit Testing</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766620&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766620&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td>Fri Feb 27, 2015</td>
<td><strong>Vent Lab Report</strong> (<a href="https://canvas.uw.edu/courses/975189/assignments/2698166">https://canvas.uw.edu/courses/975189/assignments/2698166</a>)</td>
<td>due by 11:59pm</td>
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<td>Mon Mar 2, 2015</td>
<td><strong>Protective Measures for Physical Hazards</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766619&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766619&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td><strong>Midterm Due (take home)</strong> (<a href="https://canvas.uw.edu/courses/975189/assignments/2698161">https://canvas.uw.edu/courses/975189/assignments/2698161</a>)</td>
<td>due by 5pm</td>
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<td>Wed Mar 4, 2015</td>
<td><strong>Vent: Fan Selection</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766623&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766623&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 2:20pm</td>
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<td><strong>System Design &amp; Air Cleaning Systems</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766615&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766615&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>2:30pm to 3:20pm</td>
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<td>Mon Mar 9, 2015</td>
<td><strong>Student Case Study Presentation 1 &amp; 2: (TBD)</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766609&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766609&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 3:20pm</td>
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<tr>
<td>Wed Mar 11, 2015</td>
<td><strong>Student Case Study 3: (TBD-if needed)</strong> (<a href="https://canvas.uw.edu/calendar?event_id=766617&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d">https://canvas.uw.edu/calendar?event_id=766617&amp;include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d</a>)</td>
<td>1:30pm to 3:20pm</td>
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<td>Thu Mar 19, 2015</td>
<td><a href="https://canvas.uw.edu/courses/975189/assignments/2698162">Final (take home) &lt;= WITH PEER EVALUATION FORM</a></td>
<td>6pm</td>
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<tr>
<td>Fri Mar 20, 2015</td>
<td><a href="https://canvas.uw.edu/courses/975189/assignments/2698165">Final Report Due</a></td>
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<td><a href="https://canvas.uw.edu/calendar?event_id=767808&amp;include_contexts=course_975189#7b2273686f77223a22677261f757065636f757273655f393735313839227d">UW Winter Quarter END</a></td>
<td>12am</td>
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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. Extensive use of computer design methods and a final design project are required for the extended content section. 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.

Download syllabus and course schedule.
Learning Objectives

Main Course: 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. Describe atmospheric dispersion processes and compute dispersion parameters from sampling data.
4. Apply elementary dispersion modeling concepts to estimate community impacts.
5. Compute exposure estimates for well-mixed rooms involving dilution ventilation and constant inputs.
6. Describe the function of HVAC components used for building ventilation.
7. Describe the role of HVAC in indoor air quality and infection control for healthcare settings.
8. Measure the flow characteristics of a ventilation system and apply this data for system diagnostics.
9. Select the appropriate type of local exhaust hood for controlling workplace exposures.
10. Describe criteria for selecting chemical or biological protective clothing.
11. Describe criteria for selecting protective equipment for physical agents such as noise or laser light.
12. Describe the criteria for specifying respiratory protection based on appropriate protection factors.
13. List the elements and evaluation of a comprehensive respiratory protection program.
14. Describe the inventory control and chemical hygiene requirements for hazardous materials.
15. List the key elements of a hazardous material management plan.

Additional Ventilation Section -- 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.
Grading Policy

Assignments and grading

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 discussion will be graded for content and participation.
Problem sets & discussion count for ~30% of the grade.
The midterm will count for ~30% of the grade.
The final exam / class project 30%.
Class participation and peer Evaluation ~10%.
Class Books

"Woodside"
Environmental, Safety, and Health Engineering by Gayle Woodside, Dianna Kocurek,
Contains principles of environmental engineering, safety engineering and industrial hygiene/occupational health
engineering.

"McD"
McDermott, H Ventilation for Contamination Control ACGIH Publications 2001

"IV"
Industrial Ventilation, A Manual of Recommended Practice, ACGIH Pub. 25th Ed.

"PPE/RP guide"
Personal Protective Equipment Pocket Guide,
Genium Publishing Corporation
ISBN: 0-931690-73-0 Copyright © 1995 64 pages
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.

Respirator Pocket Guide
Genium Publishing Corporation,
ISBN: 0-931690-81-1 Copyright © 1995 64 pages
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, , 46 pp, (Revised 2004).
OSHA publication #3079, Respiratory Protection, 44pp, (Revised 2002) OSHA Small Entity Compliance Guide for
Respiratory Protection Standard (CFR 1910.134), 149pp

Selected textbooks and study resources

“Woodside” Environmental, Safety, and Health Engineering by Gayle Woodside, Dianna Kocurek, Contains principles of
environmental engineering, safety engineering and industrial hygiene/occupational health engineering. ISBN: 0471109320,
New York, John Wiley 1997 (print on demand book)

“McD” McDermott, H Ventilation for Contamination Control ACGIH Publications 2001

Industrial Ventilation, A Manual of Recommended Practice, ACGIH Pub. 25th Ed.
Personal Protective Equipment Pocket Guide, Genium Publishing Corporation

ISBN: 0-931690-73-0  Copyright © 1995  64 pages

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.

Respirator Pocket Guide  Genium Publishing Corporation, ISBN: 0-931690-81-1  Copyright © 1995  64 pages  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, , 46 pp, (Revised 2004).

Info & class details

Contact Information
Professor Michael Yost
Department of Environmental & Occupational Health Sciences, Box 357234
Office: Health Sciences Building, Room F-225
Office Hours: by appointment only
Email: airion@uw.edu (mailto:airion@uw.edu)
Phone 206-685-7243

Students with Disabilities:
To request academic accommodations due to a disability, please contact Disability Resources for Students, 448 Schmitz, 206-543-8924 (voice), 206-543-8925 (TTY). If you have a letter from Disability Resources for Students indicating that you have a disability that requires academic accommodations, please present the letter to me so we can discuss the accommodations you might need in this class.

For questions on course content and website:
Helen Lee, Exposure Sciences Program Coordinator
Email: exposci@uw.edu (mailto:exposci@uw.edu)