ENV H 557 A: Exposure Controls (Winter 2015)

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ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH · UNIVERSITY of WASHINGTON

ENV H 557 A: Exposure Controls - Winter 2015

3 credits, graded, SLN 14303

Instructor:

Michael G Yost, Professor & Department Chair

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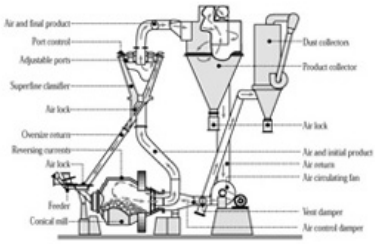
Office hours by appointment

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

Location: Health Sciences Building T-635



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

Course Description
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Date	Details	
Mon Jan 5, 2015	UW Winter Quarter BEGIN (https://canvas.uw.edu/calendar?event_id=767807&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	12am
	Hazard Ranking & Hierarchy of Controls (https://canvas.uw.edu/calendar?event_id=766626&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Wed Jan 7, 2015	Regulatory Mandates (https://canvas.uw.edu/calendar?event_id=766627&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Chemical Safety Management (https://canvas.uw.edu/calendar?event_id=766628&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to

Date	Details	
		3:20pm
Mon Jan 12, 2015	Chemical and Biological Agents (https://canvas.uw.edu/calendar?event_id=766610&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Wed Jan 14, 2015	Fluid Mechanics Primer Part I (https://canvas.uw.edu/calendar?event_id=766625&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Fluid Mechanics Primer Part II (https://canvas.uw.edu/calendar?event_id=766629&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to 3:20pm
Mon Jan 19, 2015	UW HOLIDAY - MLK Day (https://canvas.uw.edu/calendar?event_id=766611&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	12am
Wed Jan 21, 2015	Case Study 1A: Times Beach MO (https://canvas.uw.edu/calendar?event_id=766630&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:31pm to 3:20pm
	Case Study 1B: Spray Buffers in California (https://canvas.uw.edu/calendar?event_id=766621&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:32pm to 3:20pm
	The Bernoulli Equation (https://canvas.uw.edu/calendar?event_id=766631&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to 3:20pm
Mon Jan 26, 2015	Hoods & LEV (https://canvas.uw.edu/calendar?event_id=766622&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Case Study 2: Confined Spaces (https://canvas.uw.edu/calendar?event_id=766632&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to 3:20pm
Wed Jan 28, 2015	Dilution Ventilation (Marty Cohen) (https://canvas.uw.edu/calendar?event_id=766633&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Fri Jan 30, 2015	Discussion of Case Study 1B: Spray Buffers and Pesticide drift (https://canvas.uw.edu/courses/975189/assignments/2698159)	due by 5:01pm
Mon Feb 2, 2015	HVAC, Thermal Comfort, IAQ & Plenum Systems (https://canvas.uw.edu/calendar?event_id=766634&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Wed Feb 4, 2015	Hood Design & Entry Effects (Gerry Croteau) (https://canvas.uw.edu/calendar?event_id=766616&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Thu Feb 5, 2015	Discussion of Case Study 2: Confined Spaces (https://canvas.uw.edu/courses/975189/assignments/2698158)	due by 11:59pm
Mon Feb 9, 2015	Chemical Protective Clothing (https://canvas.uw.edu/calendar?event_id=766614&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to

Date	Details	
		3:20pm
Wed Feb 11, 2015	Local Exhaust System: Single Branch System Design (https://canvas.uw.edu/calendar?event_id=766624&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Vent Design - Multi Branch Systems (https://canvas.uw.edu/calendar?event_id=766618&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to 3:20pm
Sun Feb 15, 2015	LEV Design: Single Branch System Homework (https://canvas.uw.edu/courses/975189/assignments/2698163)	due by 5pm
	Problem Set 1 (https://canvas.uw.edu/courses/975189/assignments/2698160)	due by 5pm
Mon Feb 16, 2015	UW HOLIDAY - President's Day (https://canvas.uw.edu/calendar?event_id=766612&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	12am
Wed Feb 18, 2015	Respirator Selection (https://canvas.uw.edu/calendar?event_id=766635&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Case Study Assignment Guidelines (https://canvas.uw.edu/courses/975189/assignments/2698164)	due by 11:59pm
Mon Feb 23, 2015	Airflow Measurements & Troubleshooting (ROOSEVELT BUILDING) (https://canvas.uw.edu/calendar?event_id=766613&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Wed Feb 25, 2015	Case Study 3: Respirator Fit Testing (https://canvas.uw.edu/calendar?event_id=766620&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Fri Feb 27, 2015	Vent Lab Report (https://canvas.uw.edu/courses/975189/assignments/2698166)	due by 11:59pm
Mon Mar 2, 2015	Protective Measures for Physical Hazards (https://canvas.uw.edu/calendar?event_id=766619&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
	Midterm Due (take home) (https://canvas.uw.edu/courses/975189/assignments/2698161)	due by 5pm
Wed Mar 4, 2015	Vent: Fan Selection (https://canvas.uw.edu/calendar?event_id=766623&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 2:20pm
	System Design & Air Cleaning Systems (https://canvas.uw.edu/calendar?event_id=766615&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	2:30pm to 3:20pm
Mon Mar 9, 2015	Student Case Study Presentation 1 & 2: (TBD) (https://canvas.uw.edu/calendar?event_id=766609&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm
Wed Mar 11, 2015	Student Case Study 3: (TBD-if needed) (https://canvas.uw.edu/calendar?event_id=766617&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	1:30pm to 3:20pm

Date	Details	
	Final (take home) <= WITH PEER EVALUATION FORM (https://canvas.uw.edu/courses/975189/assignments/2698162)	due by 6pm
Thu Mar 19, 2015	Final Report Due (https://canvas.uw.edu/courses/975189/assignments/2698165)	due by 11:59pm
Fri Mar 20, 2015	UW Winter Quarter END (https://canvas.uw.edu/calendar?event_id=767808&include_contexts=course_975189#7b2273686f77223a2267726f75705f636f757273655f393735313839227d)	12am

Front Page

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 (https://canvas.uw.edu/courses/975189/files/29719398/download?verifier=50x6HPsmy7t4vtYhqGccUUlbJiCxg9Nb1oL8hbVX&wrap=1) (https://canvas.uw.edu/courses/975189/files/29719398/download?verifier=50x6HPsmy7t4vtYhqGccUUlbJiCxg9Nb1oL8hbVX&wrap=1) (https://canvas.uw.edu/courses/975189/files/29719398/download?verifier=50x6HPsmy7t4vtYhqGccUUlbJiCxg9Nb1oL8hbVX&wrap=1) 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 health care 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 of 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

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.
ISBN: 0471109320, New York, John Wiley 1997 (print on demand book)

"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).

OSHA publication #3079, Respiratory Protection, 44pp, (Revised 2002) OSHA Small Entity Compliance Guide for Respiratory Protection Standard (CFR 1910.134), 149pp

Info & class details

Contact Information
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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)**