

ENV HLT 255 Control of Airborne Contaminants in Industry
Fall 2017 Instructor: Hamid Arabzadeh, 949-697-5457; Hamidcih@aol.com
Monday 5pm-8:50pm; PBL HLT CHS 61-235

Course Objectives

The overall objective of this 4-unit course is to provide knowledge of the design and evaluation of methods used to control occupational exposures to airborne chemical contaminants.

The course focuses on the use of ventilation as an engineering control, as well as other methods of control like enclosure, green chemistry, dilution ventilation (DV), administrative controls, and personal protective equipment (PPE).

Upon completion of the course, the student should have sufficient understanding of such control technologies to provide a basis for making on-the-job recommendations and to evaluate existing systems, as well as to propose designs.

The instructional method includes a combination of standard lecture presentations and hands-on laboratory experience with the tools and concepts presented in lecture.

The specific objectives for the course are:

1. Provide an overview of the principles of air motion and the differences between air motions of gases/vapors and aerosols. This will allow the student to generalize to others.
2. Provide an understanding of the uses and design of local exhaust ventilation (LEV) systems. This will aid in solving and preventing ventilation problems.
3. Provide an overview of other control methods for airborne contaminants, including PPE, DV, enclosure, and green chemistry. Problems may require all of these tools to be solved.
4. Provide hands on experience with the evaluation of LEV systems and the tools used to accomplish this work. This experience will enable control problems to be solved practically.

The environmental health core competencies for EHS MS students are: A1 Retrieve and organize literature; synthesize and critically evaluate scientific literature in environmental health, public health and other relevant fields; A2 Use existing databases to provide background information or data to address research questions and draw appropriate inferences/estimates from environmental health data; A3 Evaluate seminars and presentations in environmental health and distill the critical and salient issues from them; B4 Identify potential sources of systematic error (bias) as well as random error; C1 Use computer systems and analytic software packages; D1 Make reasonable inferences from results of analysis of observational and analytic studies; E1 Prepare presentation materials including outlines, posters, and Powerpoint presentations; E2 Deliver effective oral presentations individually and as part of a team; F4 Identify and implement appropriate safety controls and practices.

The EHS MPH competencies are: C1 Describe major direct and indirect human health and safety effects of major environmental or occupational agents; C3 Describe federal and state regulatory programs, guidelines, and authorities that control environmental health issues; C5 Specify approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety; C6 Identify key sources of data and use existing databases to provide background or supportive data to address environmental health questions; C8 Developing a testable model of environmental insult

The cross-cutting public health competencies include:

- d. Demonstrating effective written and oral skills for communicating with different audiences in the context of professional public health activities
- e. Demonstrating transparency, integrity, and honesty in all actions
- f. Valuing commitment to lifelong learning and professional service including active participation in professional organizations
- g. Differentiate between qualitative and quantitative evaluation methods in relation to their strengths, limitations, and appropriate uses, and emphasis on reliability and validity

Grading: Course grades are based on laboratory write-ups, assignments, and the final exam. Late assignments and lab write-ups will be penalized at the rate of one letter grade per day late. Laboratory: 25 %; Assignments: 25 %; Final: 50 %

Required Supplies: A non-programmable scientific calculator.

Textbooks (Optional)

ACGIH: *Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition*, ACGIH, Cincinnati, OH, 2013.

ACGIH: *Industrial Ventilation: A Manual of Recommended Practice for Operation and Maintenance, 27th Edition*, ACGIH, Cincinnati, OH, 2007.

Anna, D (Ed.): *The Occupational Environment – Its Evaluation, Control and Management*, 3rd edition, AIHA Press, Fairfax, VA, 2011. Chapters 35-40.

Other useful resources:

McDermott, H.J.: *Handbook of Ventilation for Contaminant Control, 3rd edition*, ACGIH, Cincinnati, OH, 2001.

Burgess, W.A., Ellenbecker, M.J., and Treitman, R.D.: *Ventilation for Control of the Work Environment*, Wiley Interscience, New York, 1989.

Schedule

10/2: Introduction

Review of Properties of Air, Gases/Vapors and Aerosols and General Methods for the Control of Airborne Hazards

10/9: Dilution Ventilation; Local Exhaust Ventilation (LEV), Local Exhaust Ventilation.

10/16 LEV cont'd. **Assignment 1**

10/23: LEV cont'd: **Laboratory 1 Fume Hood Characterization** (3 hr)

10/30: LEV Cont'd **Laboratory 2 Duct Measurements** (3 hr)

11/6 Stack Emission Controls **Laboratory 3: Problems in LEV** (3 hr). **Assignment 2**

11/13: PPE. Respirators

11/20: PPE Respirators/Protective Clothing **Assignment 3**

11/27 PPE: Protective Clothing. **Laboratory 4: Respirator Fit Testing** (3 hr).

12/4: Administrative Controls; Other Controls and Integrating Controls; **Laboratory 5: Glove Permeation Testing** (3 hr)

12/11 FINAL EXAMINATION CHS 61-235