

SECTION 1. INTRODUCTION

ENVH 453

Industrial Hygiene

Autumn, 2009

Instructor:

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Course Web Site:

<http://courses.washington.edu/envh453a/>

Course Goals

Overall Objective: to provide an introduction to the principles and practice of occupational hygiene, for students not majoring in this subject area. Occupational hygiene is concerned with the *Anticipation, Recognition, Evaluation and Control* of work place hazards to health and safety. In this course attention is focused on the first three functions, but some consideration of control methods will also be included. These functions all require a sound understanding of industrial toxicology, methods of exposure measurement, behavior of chemical and physical agents in the environment, and the application of guidelines and standards, topics that form the basic elements of the course.

Course Objectives:

Upon completing the course, each student should expect to:

1. Describe the nature of the health effects associated with exposure to industrial agents;
2. Be familiar with the standard methods for measuring and evaluating worker exposure to chemical and physical agents;
3. Apply and interpret health and safety standards and regulations for the work place environment;
4. Explain the performance characteristics and limitations of selected personal protective equipment;
5. Adapt the general approach to controlling worker exposure to health and safety hazards to a specific industrial setting.

Course Format

Instruction will consist principally of two lecture sessions per week supplemented by the text, handouts, and recommended readings from the internet. One case study will provide the opportunity for the student to analyze and evaluate realistic industrial situations. In addition, a review of the toxicological data base for one compound from the Threshold Limit Values list will be required. The instructor will make time available to answer questions generated by the lectures, the readings, case studies or problem sets.

Course Requirements

1. Reading assignments will be made for most lectures and should be completed prior to the lecture. All required reading will be from the text, from public domain publications on the internet, or from the TLV Booklet (required texts listed below.) The student is held responsible for the material covered in the reading assignments.
2. The student is expected to select and review one compound on the Threshold Limit Value (TLV) list. A possible choice for review might be a compound whose TLV has been changed or recommended for change in the recent past, but you may select any compound or process presently having a TLV. The focus of this paper should be on whether the value selected by the ACGIH is supported by the literature cited in the TLV documentation. In other words, do you feel that the numerical value of the guideline, and its duration specification (TWA, STEL, Ceiling) are reasonable given the scientific information cited by the Conference? The primary source of information should be the Documentation of the Threshold Limit Values - copies are available in the Department Library (F-453) or in F-226 for examination, but you should also seek out the original research articles cited in the Documentation in order to make your decision.
The paper should be 5 to 10 double spaced pages in length and should demonstrate that you have read and critically analyzed the original basis for the TLV and, where applicable, the data that led to the change or recommendation for change in the TLV. A short bibliography should be included, reflecting the literature examined in preparing the review.
3. A case study will be completed for which the written assignment will be a detailed, but concise, analysis of the case materials. The student should respond to the specific questions raised in the case material but also should use outside resource materials to critically review the case.

The case study report will be evaluated using the following major criteria:

- a. Demonstration that the student understands the process(es) being reviewed
- b. Use of the data provided
- c. Evaluation of the quality and limitations of the data
- d. Use of outside resources to evaluate hazards. Please cite the references used.
- e. Applicability and practicality of the control procedures specified
- f. Style and clarity of presentation

The case assignment is due on the date indicated in the course outline. If turned in late, the grade will be decreased by 1% for each day past the assigned due date.

4. Homework problems will be assigned weekly. The problems will illustrate course principles, and will provide guidance in preparation for the examinations.

Evaluation

1. One one-hour examination will be given mid-term, covering all material assigned prior to that date.
2. One two-hour final exam covering all the material for the course will be given during the regularly scheduled final examination period.
3. Case study and TLV review paper.
4. Homework

Assignment weighting in determining final grade:

| | <u>% of grade</u> |
|---------------------|-------------------|
| Mid-term exam | 15 |
| Final two hour exam | 20 |
| TLV review paper | 20 |
| Homework | 20 |
| Case Study | 25 |

Required Texts

Morgan, M.S., Horstman, S.W. *Introduction to Occupational Hygiene*. 2009. Available free of charge on course web site, as a series of pdf documents.

ACGIH TLV Booklets, 2009 Edition: Provided free of charge.

Suggested General References

- These are available for use in the Department Library F-453, or for loan in F-226:

Plog, B.A., ed., *Fundamentals of Industrial Hygiene*, 4th Ed. National Safety Council, Chicago, IL, 1996.

American Conference of Governmental Industrial Hygienists. *Documentation of the Threshold Limit Values*. 7th Edition. 2001. (Earlier editions also available.)

Cralley LJ and Cralley LV, eds. *Patty's Industrial Hygiene and Toxicology*, Volume III: Theory and Rationale of Industrial Hygiene Practice, Part A: The Work Environment and Part B: Biological Responses. 2nd Ed. New York: Wiley Interscience, 1985.

Cralley LV, Cralley LJ, eds. *Industrial Hygiene Aspects of Plant Operations: Volume 3, Engineering Considerations Equipment Selection, Layout and Building Design*. New York: MacMillan, 1985.

Finkel AJ. *Hamilton and Hardy's Industrial Toxicology*. 4th Ed. Littleton, MA: PSG Publishing Co. 1983.

Peterson APG, Gross EE. *Handbook of Noise Measurement*. 7th edition. Concord, MA: General Radio, 1974.

Finucane EW. *Definition, Conversions, and Calculations for Occupational Safety and Health Professionals*. Boca Raton, FL: Lewis Publishers, 1993.

Dinardi SR. *Calculation Methods for Industrial Hygiene*. New York: Van Nostrand Reinhold, 1995.

McDermott HJ. *Handbook of Ventilation for Contaminant Control*. Second Edition. Boston: Butterworth Publishers, 1985.

Perkins JL. *Modern Industrial Hygiene*. Volume I. Recognition and Evaluation of Chemical Agents. New York: Van Nostrand Reinhold, 1997.

DiNardi SR, ed. *The Occupational Environment - Its Evaluation and Control*. Fairfax, VA: American Industrial Hygiene Association, 1998.

Popendorf WS. *Industrial Hygiene Control of Chemical Hazards*. Boca Raton, FL: CRC Press, 2006.

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Course Schedule, Autumn, 2009

| No. | Date | Topic | Reading |
|-----|--------|---|------------------|
| 1 | 1 Oct | Introduction, Review of Chemical Arithmetic, Principles of Air Contamination | Sections 1 and 2 |
| 2 | 6 Oct | Principles of Air Contamination, cont. | Section 2 |
| 3 | 8 Oct | Principles of Industrial Toxicology | Section 3 |
| 4 | 13 Oct | Legislation and Regulation of Workplace Hazards | Section 4 |
| 5 | 15 Oct | Guidelines and Standards for Occupational Exposure | Section 5 |
| 6 | 20 Oct | Workplace Surveys, Sampling Strategy | Section 6 |
| 7 | 22 Oct | Data Interpretation and Quality Control | Section 7 |
| 8 | 27 Oct | Dust Sampling Methods | Section 8 |
| 9 | 29 Oct | Gas and Vapor Sampling Methods | Section 9 |
| 10 | 3 Nov | Biological Monitoring | Section 10 |
| 11 | 5 Nov | <u>Mid-Term Examination</u> | |
| 12 | 10 Nov | Noise Exposure and Control | Section 11 |
| 13 | 12 Nov | Noise Exposure and Control, continued | |
| 14 | 17 Nov | <u>Term Paper (TLV Review) due</u> ; Discussion of TLV; Overview of Case Study Workplace | Handout |
| 15 | 19 Nov | Radiation Exposure and Control | Section 12 |
| 16 | 24 Nov | Asbestos Exposure Assessment – Lee Monteith | Handout |
| 17 | 1 Dec | Exposure to Heat and Cold Stress | Section 13 |
| 18 | 3 Dec | Industrial Ventilation for Contaminant Control | Section 14 |
| 19 | 8 Dec | Personal Protective Equipment | Section 15 |
| 20 | 10 Dec | <u>Case Study due</u> ; Ergonomics and Injury Prevention | Section 16 |
| | 18 Dec | <u>FINAL EXAMINATION</u> : 2:30-4:20 PM | |