ENVH 555
Industrial Hygiene Methods: Laboratory

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Class Website: http://courses.washington.edu/envh555

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Schedule
Course hours are on Monday and Wednesday, 12:30 - 4:30. The attached schedule of the
experiments gives more information about the types of sampling and analysis that will be
covered in each experiment.

References
The course text for ENVH 555 is the Lab Manual. Additional readings may be assigned for
specific lab experiments, and those are noted in the lab guide for each experiment. Those
students who have not taken ENVH 553 should ask about additional reference material.
Suggested references are:

Ramachandran, G., Occupational Exposure Assessment for Air contaminants, CRC Press,
Boca Raton FL

McDermott, H.J., Air monitoring for toxic exposures, 2nd Ed. John Wiley and sons,
Hoboken, NJ

Cohen, BS and McCammon, CS Jr., eds. Air Sampling Instruments, 9th edition.
Cincinnati: ACGIH, 2001. (Reserve Copy in the Department Library)


0500--Nuisance Dust
0600--Respirable Dust
7400--Sampling and Analysis of Fibers in air

ENVH 555/2008/CS; Syllabus, pg. 1
3500--Formaldehyde
7082--Lead
7030--Zinc
1500—Hydrocarbons
9002--Bulk Asbestos Method


Pt. 2, Inorganic substances, Vol. 1 & 2 ('91)

The Occupational Environment: Its Evaluation and Control, Edited by S.R.DiNardi,’ AIHA

Copies of important readings from the references should be on reserve in the Environmental
Health Library (F453), the Laboratory (T564) or in Room F226, HSB.
Course Description:
This course and the companion lecture course ENVH 553 cover the detection, sampling and analysis techniques for Industrial Hygiene assessment and monitoring. ENVH 553 is taught in the previous quarter to avoid scheduling problems with experiments sometimes coming before the corresponding descriptive and theoretical material has been covered. The laboratory experiments are intended to simulate typical industrial hygiene measurement situations and to provide a basis for the selection of sampling and analytical techniques and for the critical evaluation of the laboratory results.

The course emphasizes industrial hygiene sampling and measurement techniques primarily for airborne exposures to chemical agents. Students are introduced to the most common types of field measurements, sampling methods and laboratory analyses, which are used in evaluating occupational health hazards. A familiarization with the instrumentation and techniques is obtained through application in a laboratory-based scenario. The direct measurement techniques are compared to each other and to laboratory based methods. Methods of generating test atmospheres are used to provide concentrations for field type sampling methods. Typical samples are collected for later laboratory analysis. The principles of sampling are emphasized and the laboratory results and environmental results are evaluated by use of quality control measures. The students will learn the format as well as the content of a number of the standard methods that are used.

Content
- Calibration of airflow measuring devices
- Aerosol sampling using filter samplers, cyclones and cascade impactors. Aerosol analysis using gravimetric and real-time methods.
- Direct measurement techniques for gases and vapors: Detector tubes, direct reading instruments, colorimetric wet chemical methods.
- Infra red spectroscopy: non-dispersive carbon dioxide monitor and the dispersive MIRAN instrument for the measurement of single compounds and the evaluation of mixtures in air.
- Adsorption sampling for organic gases using charcoal tube and badge samplers and analysis by gas chromatography.
- Asbestos is identified in bulk materials by polarized light microscopy and is analyzed in air samples by NIOSH Method 7400 using phase contrast microscopy.
- Computer spreadsheet technology will be applied to the processing of the data and for testing method reliability.
- Atomic absorption and x-ray fluorescence spectroscopies for analysis of metals in airborne particles and surface samples.

Course Learning objectives:
At the end of this course, students should be able to accomplish the following:

1. Identify literature sources of standard methods for measurement of occupational exposures to chemical contaminants
2. Identify the advantages and the limitations inherent in a variety of techniques and instruments used for industrial hygiene measurements (and what specific factors in the sampling situation might prevent accurate application of that approach).
3. Provide a framework for selection of appropriate methods for measurements of specific workplace contaminants.
4. Demonstrate knowledge of the operating principles of several kinds of currently-used field meters for chemical agents. Demonstrate proficiency in the use of these devices.
5. Demonstrate knowledge of the operating principles, advantages and limitations of several kinds of major laboratory instruments commonly used for chemical analysis.
including: FTIR, UV/visible absorption spectrometers, gas chromatographs, atomic absorption spectrometers. Demonstrate proficiency in the operation of these devices.

6. Apply basic concepts in quality control and quality assurance for chemical measurement data.

7. Critically evaluate the reliability of chemical measurement data.

8. Express and interpret correctly the chemical measurement results in terms that are applicable to occupational standards and situations.

9. Demonstrate competency in technical writing

10. Demonstrate the ability to work effectively and co-operatively as part of a team.

Responsibilities
The student responsibilities for the course are the following:

1. Prepare in advance of each lab period. Read/understand each experiment and assigned readings before class. Complete all necessary calculations for adequate sampling times, for standards preparations and for dilution schemes to provide appropriate concentrations.

2. Submit a lab report on each experiment. Reports will be due one week from the scheduled completion date for each experiment, unless otherwise announced.

The students will work in pairs or small groups for most of the experiments. However, each student is responsible for taking part in all phases of each experiment and for preparing and submitting a report of their lab results and findings.

Class organization:
Refer to the class schedule. The course consists of laboratory sessions every Monday and Wednesday. Teams of 3-5 students will work co-operatively to undertake each experiment. Students will prepare individual reports describing their finding from each experiment. These reports are due one week after the completion of each laboratory experiment.

Grading
Each experimental report will be graded as described in the Reports Section. The questions at the end of the procedures will be given emphasis because of their importance. Penalties for late reports could affect the grades.

Students with Disabilities:
To request academic accommodations due to a disability, please contact Disabled Student Services, 448 Schmitz, 206-543-8924 (voice/TTY). If you have a letter from Disabled Student Services 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.