

EHS 253 Physical Agents in the Work Environment

Winter 2017

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Lecture: Mondays 8a-10a; CHS 71-257 EHS 253A

Laboratory EHS 253B: Specific Mondays 10a – 11:50a CHS 56-059; Presentations in CHS 71-257. When there are no labs, lectures are continued through 11:50a

The general objective of this course is to introduce students to the health hazards and control of physical agents in the workplace. This will be done primarily through lectures on the physiology of target organs, physics principles, measurement methods, health effects ,and control methods of noise, radiation (ionizing and non-ionizing), and thermal stress in the work environment.

Students will also receive laboratory based instruction and demonstration of principles covered in the lecture. Additionally, presentation of a peer-reviewed article on a topic relevant to the course material will occur.

The specific objectives for the lectures are:

1. Understand the basic physics of sound and sound propagation
2. Understand the principles behind the measurement of sound, including octave band analysis.
3. Understand the current occupational exposure limits for noise exposure.
4. Understand auditory physiology and the health effects associated with exposure to noise.
5. Identify and recommend appropriate noise control methods.
6. Understand the principles, health effects, measurement and control of thermal stress.
7. Understand the basic physics of ionizing and non-ionizing radiation.
8. Understand the current occupational exposure limits for exposure to ionizing and non-ionizing radiation.
9. Recognize the limitations to current knowledge of health effects associated with exposure to low energy non-ionizing radiation.
10. Understand the health effects associated with exposure to ionizing and high-energy non-ionizing radiation.
11. Understand the principles behind the control of occupational exposure to radiation.

The specific objective for the laboratory exercises are:

1. Investigate and measure the propagation of sound.
2. Investigate and evaluate different methods of noise control.

3. Use, calibrate and understand limitations of instruments used to measure sound.
4. Investigate and measure thermal environment using a variety of instruments.
5. Introduction to instruments used to evaluate exposure to radiation.
6. Select, read, analyze, present and lead discussion on a peer-reviewed journal article related to a physical agent in the workplace.

The Environmental Health competencies for EHS Master of Science 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.

The following cross-cutting public health competencies (CC) are also reflected in the design and content of the course: communication and informatics; leadership; public health biology; professionalism; program planning; systems thinking.

Textbook: There is no required text for this course. The instructor will provide reading materials as needed. Recommended books include:

Berger, E.H., et al (eds.): The Noise Manual, 5th edition, AIHA Press, Fairfax, VA, 2000.

Anna, DH (ed.): The Occupational Environment, Its Evaluation, Control and Management, 3rd edition, AIHA Press, Fairfax, VA 2003. Chapters 24-29. **These will be distributed electronically.**

Plog, B.A. and Quinlan, P.J. (eds.): Fundamentals of Industrial Hygiene, 5th edition, National Safety Council, 2002, pp83-122, 207-356

ACGIH. 2016 TLVs and BEIs, ACGIH, Cincinnati OH 2015. pp125-179. Medical Bookstore.

Grading: Student understanding and mastery of the presented material will be assessed by performance on homework and exams. Students will also submit laboratory reports for evaluation and orally present a journal article.

The course grade will be determined as follows:

- Homework: 25%
- Lab Work/Presentations: 25 %
- Final exam: 50%

Date Lecture/Date Laboratory

01/09 Introduction: Noise – Physics of Sound and Measurement . No laboratory.

01/16 No lab or lecture. Martin Luther King Jr Holiday.

01/23 Vibration; Whole body and hand arm. No laboratory.

01/30 Noise – Physiology and Noise-Induced Hearing Loss. Lab: Sound Measuring instruments

02/06 Noise – Control, Vibration and Ultrasound . Presentations on noise. Lab: Octave band analysis and dosimetry.

02/13 Ionizing Radiation Part I . Lab: Geiger counting

02/20 No lab or lecture. Presidents Day Holiday.

02/27 Non-ionizing Radiation: Visible, IR, UV, Microwave, EMF, Laser. Ionizing radiation presentations.

03/06 Lab: Measurement of light and infrared radiation.

03/13 Thermal Stress. Laboratory on heat stress. Non-ionizing radiation presentations.

03/20 Final Examination (3 hours; Bring your calculator)