Summary

Physical hazards in the workplace include ionizing and non-ionizing radiation, noise, vibration, temperature extremes, and poor ergonomic conditions. Occupational health specialists should be able to recognize physical agents, assess exposure to the agents, determine when the agents present a hazard to workers, and recommend strategies for controlling the exposure, if necessary. This course will survey a variety of physical agents commonly found in workplaces. Several guest lecturers familiar with particular hazards will share their expertise with participants. In addition, students will be able to see and try out instruments used to measure exposure to many of the hazards. The course will include a group project in which the students will research a type of physical agent not otherwise considered during the course, teach the rest of the class about their findings, and develop a web site presenting information on their topic.

Course Information

Mondays, 4:40 – 6:40 PM  (we'll take a 5-10 minute break during lectures)
Moos Tower 1-430
2 credits

Instructor Information

Lead Instructor:
  Pete Raynor, Ph.D., Assistant Professor
  Office: Mayo 1230
  Office phone: (612) 625-7135
  Office hours: By appointment
  Email: praynor@umn.edu
  Home phone: (952) 513-0729 (before 10:00 PM)

Many guest instructors!!

Course Materials

Learning Objectives

By the end of the course, students should be able to:
• describe the physical properties of physical agents
• explain how physical agents interact with the human body
• list the regulations and guidelines that govern workplace exposure to physical agents
• select instruments to measure exposure to physical agents
• participate in the design of a radiation safety program
• participate in the design of a hearing conservation program
• participate in the design of an ergonomics program
• prioritize potential control solutions when confronted with a physical hazard
• present a lesson on a physical agent to adult learners
• participate in the development of a web page with information on a physical agent

Course Grading

Grading in the course will be comprised of homework assignments, in-class quizzes, and a group project.

The course will include 5 homework assignments. The assignments will be posted on the course's WebCT site at least 2 weeks prior to the due date. Due in the hands or mailbox of Dr. Raynor on the dates indicated on the course schedule, they will each be graded on a 100-point scale. The grades will be reduced by 5 points for each weekday that the assignment is late. Although students may discuss their assignments with one another, each student should submit a product that demonstrates significant independent effort.

At the beginning of each class session other than the first and the last, a 5-minute quiz will be administered on the required reading/viewing for that day. The quiz questions will be true/false, multiple choice, or short answer and will be graded on a 10-point scale. A total of 12 quizzes will be administered; the 10 highest of these 12 grades will count toward the final course grade.

Students will work in teams of 3-4 on a project to learn about a physical agent not otherwise covered in class and to teach the rest of the class about the agent. Topics to be studied about each agent include the properties of the agents, the effects on worker health, methods of measuring exposure, and ways to minimize harmful effects of the agent. On the final day of class, project teams will present a 30-45 minute lesson on their topic to the rest of the class. In addition, project teams will develop a web site on their topic that will become part of the content on the Division of Environmental Health Sciences web site. Further details on the project will be provided to students during the semester.

For all work, partial credit will be awarded generously, so students should show all work. In addition, the neatness of the work is important because the instructor will be able to follow the students' reasoning more easily when trying to award partial credit.

The course will have neither a midterm nor final exam.
The breakdown of grading for the course is:

Quizzes 20 %
Homework assignments 40 %
Project lesson 20 %
Project web page 20 %

Final grades for the A/F option will be assigned as follows:

A (93-100 %) Outstanding achievement relative to course expectations
A− (90-93 %)
B+ (87-90 %)
B (83-87 %) Achievement above minimum course expectations
B− (80-83 %)
C+ (77-80 %)
C (73-77 %) Achievement meeting the minimum course expectations
C− (70-73 %)
D+ (67-70 %)
D (60-67 %) Achievement below minimum expectations, but sufficient for credit
F (< 60 %) No credit awarded

Final grades for the S/N option will be assigned as follows:

S (70-100 %)
N (< 70 %) No credit awarded

The lead instructor reserves the right to modify this grading structure to the advantage of the students should the minimum course expectations prove to be too ambitious.

**What the Instructors Expect from Students**

- Students are expected to attend all classes and to arrive on time.
- Students should review assigned readings prior to class.
- Students will download handouts and assignments from the course's WebCT Vista page at [http://webct.umn.edu](http://webct.umn.edu)
- Students should bring a calculator to all classes.
- Students are expected to answer questions posed by the instructors and participate in classroom discussions.
- Students are responsible for asking questions and/or letting instructors know when they do not understand lectures or course materials.
- Although students may discuss assignments together, each student's work should reflect independent thought.
- Students will work together cooperatively in teams on their course projects.
- Students are encouraged to provide constructive feedback to the instructors when they are dissatisfied with the course content or teaching methods.
What Students Should Expect from the Instructors

- The instructors will be enthusiastic about the class and the subject matter.
- The instructors will post handouts and assignments on WebCT Vista.
- The instructors will begin and conclude classes on time.
- The instructors will state objectives for each class session.
- Respecting the students' styles of learning, the instructors will use a variety of instructional methods.
- The instructors will answer all questions posed during class by students. Whenever possible, questions will be answered immediately. As an alternative, the lead instructor may indicate that the question will be addressed later in the class or that he will answer the question at the beginning of the next lecture if he does not know the answer.
- The instructors will ensure that all discussions in class are conducted in a professional and collegial manner.
- The lead instructor will create assignments with clear expectations.
- The lead instructor will grade and return assignments within one week of submission.
- The lead instructor will grade assignments objectively.
- The lead instructor will provide feedback on assignments that identifies both strengths and weaknesses in student work with constructive suggestions for improvement.
- Periodically, the lead instructor may solicit and respond to feedback on ways to improve the course.
- The instructors will make themselves available outside of class to discuss any aspect of the course with students.

Additional Information

Every class is influenced by the fact that participants bring diverse values, experiences, and abilities into the classroom. All participants will be expected to listen to those with differing views, disagreeing with the views while remaining respectful of the individuals who hold them. Students should feel free to question the instructors and each other collegially at any time.

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw. Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Student Services Center at sph-ssc@umn.edu for further information.

An incomplete grade is permitted only in cases of extraordinary circumstances and following consultation with the instructor. In such cases an "I" grade will require a specific written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements. Extension for completion of the work will not exceed one year.

The University of Minnesota Uniform Grading and Transcript Policy can be found at onestop.umn.edu.
Students are responsible for maintaining scholastic honesty in their work at all times. Students engaged in scholastic dishonesty will be penalized, and offenses will be reported to the Office of Student Academic Integrity (OSAI, www.osai.umn.edu). The University’s Student Conduct Code defines scholastic dishonesty as "plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis." Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity: http://writing.umn.edu/tww/plagiarism/.

Students are urged to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to http://tutorial.lib.umn.edu/ and click on "Citing Sources". In addition, original work is expected in this course. It is unacceptable to hand in assignments for this course for which you receive credit in another course unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable. If you have any questions, consult the lead instructor.

Students are responsible for knowing the University of Minnesota, Board of Regents' policy on Student Conduct and Sexual Harassment found at www.umn.edu/regents/polindex.html.

It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have a documented disability (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services to have a confidential discussion of their individual needs for accommodations. Disability Services is located in Suite180 McNamara Alumni Center, 200 Oak Street. Staff can be reached by calling 612/626-1333 (voice or TTY).
Course Schedule

1/28/08  Week 1  **Course Introduction (Raynor)**
Course syllabus, schedule, and requirements; discussion of student projects; types of physical agents

**Introduction to Ionizing Radiation (Raynor)**
Types of radiation; radioactive decay; electromagnetic spectrum; terminology; units

2/4/08  Week 2  **Ionizing Radiation (Mike Lewandowski, 3M)**
Common industrial sources; health effects; exposure monitoring; engineering controls; radiation safety programs at 3M


**Supplemental Reading:** *The Occupational Environment – Its Evaluation and Control*, Chapter 22, pp. 581-602

2/11/08  Week 3  **Ionizing Radiation (Brian Vetter, University of Minnesota)**
Radiation sources; routes of exposure; instrumentation for measuring emissions; demonstration of instruments; radiation safety programs at the U


2/18/08  Week 4  Introduction to Projects (Raynor & Michelle Mansfield)

Non-Ionizing Radiation (Raynor)
Types of radiation; visible light radiation; lasers


Supplemental Reading: The Occupational Environment – Its Evaluation and Control, Chapter 21, pp. 491-519

2/25/08  Week 5  Non-Ionizing Radiation (Raynor)
Infrared radiation; ultraviolet radiation; extremely low frequency radiation; radiofrequency and microwave radiation


Supplemental Reading: The Occupational Environment – Its Evaluation and Control, Chapter 21, pp. 519-546

HOMEWORK #1 (Ionizing Radiation) DUE

3/3/08  Week 6  Temperature Extremes (Rebecca Galkiewicz)
Cold stress; heat stress and heat strain


Supplemental Reading: The Occupational Environment – Its Evaluation and Control, Chapters 24 & 25
3/10/08  Week 7  **Introduction to Noise (Raynor)**  
Elements of sound; units; frequency weighting  

**Vibration (Raynor)**  
Characteristics of vibration; health effects; measurement  

**Required Viewing:**  (1) NIOSH Noise Meter,  
[http://www.cdc.gov/niosh/topics/noise/about/help/noisemeter_flash/soundMeter_flash.html](http://www.cdc.gov/niosh/topics/noise/about/help/noisemeter_flash/soundMeter_flash.html),  
(2) Play with NIOSH Hearing Loss Simulator, follow directions posted on WebCT Vista page,  
(3) Canadian Centre for Occupational Health and Safety,  

**Supplemental Reading:**  *The Occupational Environment – Its Evaluation and Control*, Chapter 20, pp. 425-434, 468-477  

**HOMEWORK #2 (Non-Ionizing Radiation) DUE**

3/17/08  **SPRING BREAK!!**

3/24/08  Week 8  **Noise (Ted Madison, 3M)**  
Regulations relating to noise and hearing; hearing loss prevention; hearing conservation programs  

**Required Reading:**  OSHA Technical Manual, Section III, Chapter 5,  
*Noise and Hearing Conservation*, Sections I, II, and IV,  

**Supplemental Reading:**  *The Occupational Environment – Its Evaluation and Control*, Chapter 20, pp. 434-468  

3/31/08  Week 9  **Noise (Mike McCullough & Marc Roe, 3M)**  
Noise measurement; demonstration of instruments; exposure assessment  

**Required Reading:**  OSHA Technical Manual, Section III, Chapter 5,  
*Noise and Hearing Conservation*, Section III,  

**Supplemental Reading:**  OSHA Standards, 29 CFR 1910.95,  
*Occupational Noise Exposure*,  

**HOMEWORK #3 (Temperature Extremes) DUE**
4/7/08  Week 10  **Ergonomics (Phil Jacobs)**  
Introduction to ergonomics; anthropometry; problem solving


**Supplemental Reading:** *The Occupational Environment – Its Evaluation and Control*, Chapter 26

4/14/08  Week 11  **Ergonomics (Phil Jacobs)**  
Upper extremity work related musculoskeletal disorders (WRMSD); job and task analysis


**Supplemental Reading:** *The Occupational Environment – Its Evaluation and Control*, Chapter 27

**HOMEWORK #4 (Noise) DUE**

4/21/08  Week 12  **Ergonomics (Phil Jacobs)**  
Back and manual material handling (MMH) injuries; ergonomic standards, laws, rules, and guidelines


4/28/08  Week 13  **Ergonomics (Phil Jacobs)**  
Video display terminal (VDT) workstations; lighting and illumination; cognitive ergonomics


**Supplemental Reading:** *The Occupational Environment – Its Evaluation and Control*, Chapter 28
5/5/08  Week 14  Group Project Student-Run Lessons
Each lesson will last about 30 minutes

Course Evaluation

[HOMEWORK #5 (Ergonomics) DUE]

5/16/08  GROUP PROJECT WEB PAGES FINALIZED BY 5:00 PM