Oakland University
School of Health Sciences
Occupational Safety and Health Program

Course Syllabus:
ENV446/OSH 446-Industrial and Environmental Toxicology (3), Winter, 2010

Instructor and Class Meeting Information:

Instructor: Patrick Frazee.
Office: 310 Hannah Hall
Office Hours: Thursday, 7-8 pm
Phone: 586-419-9722
Fax: 248.370.4227
E-mail: frazee@oakland.edu
Class Sessions: Online
Class Location: Online

Catalog Description:
Introduction to the basic concepts and techniques of toxicology, with special attention given to the industrial environment. Evaluation of the toxic effects of substances and toxic responses to various substances. This class satisfies the General Education requirements in the Intensive Writing Area. Cross listed with ENV 484 Environmental Toxicology
Prerequisites: BIO 104, CHM 201, OSH 335.

Required Text:

General Education Learning Outcomes:

Upon completion of this course, the student should be able to demonstrate:

1. appropriate uses of a variety of methods of inquiry and a recognition of ethical considerations that arise in an industrial environment.
2. the ability to integrate the knowledge learned in general education and its relevance to the student’s life and career as a safety and health professional.
3. knowledge of the elements, writing processes, and organizing strategies for creating analytical and expository prose.
Course Objectives:

Upon completion of this course, students should be able to:

1. Define commonly used terms related to toxicology including, toxicokinetics, toxicodynamics, toxicology, dose-response relationships, toxicity, and lethality of chemicals and drugs.
2. Describe nomenclature commonly used in toxicology and explain the process of identifying toxicological agents in the United States.
3. Examine and use the decision making process in evaluating the toxicity of chemicals on humans.
4. Differentiate and detect adverse chemical reactions, appraise toxicovigilance, and compare the effects of disease created by chemical exposure.
5. Construct models of biological variability, integrate toxic chemical dosage versus toxic chemical effect, formulate margins of safety in toxic chemical exposure.
6. Appraise toxic chemical regulations on exposure, compare risk versus benefit in different age groups, evaluate the impact of exposure detection mechanisms and assess adverse reactions on humans after exposure.
7. Develop a hypothesis as to chemical interactions, analyze data, and prove conclusion from accumulated material sampled.

Cross-Cutting Capacities:

Upon completion of this course, the student should be able to demonstrate:

1. Effective communications in both written and verbal form which are essential to successful completion of this course.
2. Critical thinking skills required to apply general education and OSH major course to site-specific applications of toxicology in today’s industrial environment.
3. Information literacy skills necessary to apply classroom learning and research skills necessary to address toxic chemical interactions in the workplace.

Class Schedule:

Week 1 - Introduction: Historical review and role of Industrial Toxicology, Basic Concepts in Toxicology; Dose/Response curves and data and Risk Assessment (Text, chapters 1, 2, and 4)

Week 2 – Chemical Reactivity and Mechanisms of Toxicants (Text, chapter 3)

Week 3 - Absorption, Distribution and Excretion of Toxicants, Toxicokinetics (Text, chapters 5, 7)
Week 4 - Absorption, Distribution and Excretion of Toxicants, Toxicokinetics continued (Text, chapters 5, 7)

Exam 1

Week 5 - Biotransformation of Toxicants (Text, chapter 6)

Week 6 - Inhalation Toxicology –silica, asbestos, fibers, particles (Text, chapter 15); Toxic Responses of the Eye _ Caustics and Acids (Text, chapter 17), Toxicology of the Skin (Text, chapter 19),

Week 7 – Carcinogenesis (Text, chapter 8);
Week 8 - Toxicity of Metals (Text, chapter 23)

Exam 2

Week 9 - Nervous System Toxicology (Text, chapter 16); Toxic Effects of Solvents and Vapors (Text, chapter 24),

Week 10- Toxic responses of the Reproductive System and Endocrine System (Text, chapter 20 and 21)
Week 11 - Toxic Effects of Radiation and Radioactive Materials (Text, chapter 25); Occupational Toxicology (Text, chapter 33)

Week 12 – Presentation of student research papers
Week 13 – Presentation of student research papers

Final Exam

Course Procedures:

This class is an online course with weekly opportunity for group discussion by the students to support an active learning environment. Two traditional exams are given throughout the course and a major portion of the student grade is determined by an independent toxicological research project resulting in a major term paper and oral presentation and defense of the student’s research findings.

Expectations of Student:

Active participation in online chat/Elluminate sessions; student learning. Articles on pertinent toxicological issues will be presented and discussed by students. Out of class research is required to complete a major term paper. The student is expected to prepare a professional oral presentation of the toxicological research topic choose by the student.
**Grading Determination:**

Class grade points are determined by the following performance measures.

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<th>Test Instrument</th>
<th>Percentage</th>
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<tr>
<td>Assignments</td>
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<td>Exam 1</td>
<td>20</td>
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<td>Exam 2</td>
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<td>Student Presentation and Term Paper</td>
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<td>Final examination</td>
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**Academic Conduct Policy:**

Plagiarism, falsifying records or reports, and unauthorized collaboration, access, or modifying of computer programs are considered serious breaches of academic conduct. The Oakland University policy on academic conduct will be strictly followed with no exceptions. See the OU catalog under Academic Policies and Procedures in this regard.

**Add/Drops:**

The University add/drop policy will be explicitly followed. It is the student’s responsibility to be aware of the University deadline dates for dropping the course.

**Special Considerations:**

Students with disabilities who may require special considerations should make an appointment with campus Disability Support Services. Students should also bring their needs to the attention of the instructor as soon as possible.
1. Select two (2) chemicals, one an industrial chemical commonly used in industry and a pharmaceutical chemical used by the general public.

2. The term paper must include an Introduction Section which describes the general category and information pertaining to both the industrial chemical and the pharmaceutical drug selected.

3. A discussion on the Toxicokinetics of the industrial chemical and a discussion of the Pharmacokinetics of the pharmaceutical drug must cover the following areas:
   a. Absorption
   b. Distribution
   c. Storage
   d. Metabolism
   e. Excretion

4. A discussion on the Toxicodynamics of the industrial chemical and a discussion of the Pharmacodynamics of the pharmaceutical drug must cover the following areas:
   a. Interaction at the tissue or effector organ
   b. Toxic effects
   c. Therapeutic effects
   d. Mechanism of action for toxicity or therapy
   e. Side effects or secondary effects

5. State the chemical and drug interaction as both interact with body tissue, organs, or physiological functions. Determine whether the interaction is:
   a. Additive
   b. Antagonistic
      1. Chemical
      2. Dispositional
      3. Functional
      4. Receptor
   c. Synergistic
   d. Potentiation

6. Statement of Conclusion discussing the harmfulness if both chemicals are present in the human body.

7. Student term papers will be typed including a bibliography with ten references. Each presentation will last between 15-20 minutes followed by a question and answer period.
   A. Oral presentations should include a summary of each topic in the term paper.
B. All oral presentations will be accompanied by a power-point presentation.

Term papers must be typed, double-spaced on 8.5 x 11 inch paper with 1 inch

**Recommended Readings for peer-reviewed studies:**
- British Journal of Industrial Medicine: OU Library Call # RC963.A23
- Medical Toxicology; Diagnosis and Treatment of Human Poisonings
- Principles and Methods of Toxicology; Hayes
- Industrial Hygiene and Toxicology; Patty
OAKLAND UNIVERSITY
Occupational Safety & Health Program
ORAL PRESENTATION EVALUATION

Date: __________
IHS Course #: __________
Title of Presentation: ______________________________________________________
Student Presenter: __________________________________________________________

Evaluation Scale:

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INTRODUCTION:

Well Planned and Organized? 1 2 3 4 5
Clear Learning Objectives? 1 2 3 4 5
States Purpose of Training? 1 2 3 4 5
Humor, Stories, Quotations, Stats? 1 2 3 4 5

BODY:

Instructional Aids(Tools/Equip)? 1 2 3 4 5
Audio/Visual Aids? 1 2 3 4 5
Questions for Class? 1 2 3 4 5
Examples, Illustrations, Experiences? 1 2 3 4 5
Materials Needed? 1 2 3 4 5
References Required? 1 2 3 4 5
Taught to Objectives? 1 2 3 4 5
Time Controls? 1 2 3 4 5
ORAL PRESENTATION CHECKLIST - Continued

Date: __________
IHS Course #: __________
Student Presenter: _____________________________

Evaluation Scale:
Poor | | | Outstanding

CLOSURE/SUMMARY:
Covers Highlights/Key Points?   1 2 3 4 5
Learning Objectives Reviewed?   1 2 3 4 5
Good Overview?                  1 2 3 4 5

ASSESSMENT ACTIVITIES:
Quiz?                           1 2 3 4 5
Demonstration?                  1 2 3 4 5
Other Assessment?              1 2 3 4 5
Based on Learning Objectives?  1 2 3 4 5
Assigned Follow-up Activities?  1 2 3 4 5

COMMENTS:
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CHECKLIST FOR SUMMARIZING A RESEARCH PAPER

θ Study Objectives or Statement of the Research Problem

What are the objectives of the study or what are the questions to be answered?

θ Hypotheses

What are the study hypotheses and are they clearly defined? Do the hypotheses logically follow from the literature review? Are the hypotheses testable with the data collected?

θ Design of the Investigation

What is the study design and what are its inherent strengths and weaknesses? Examples of various study designs include: ecological correlations, proportionate mortality studies, retrospective cohort studies, cross-sectional studies, and experiments.

θ Sample

How was the sample selected? What population is the sample supposed to represent? Are there possible sources of selection bias which would make the sample atypical or nonrepresentative? If so, what provisions were made to deal with the source of bias? What is the nature of the control group or standard of comparison? How was the control group selected? Is the selection and size of the study and control groups justified?

θ Study Results

Are the study results presented clearly, objectively and in sufficient detail to enable the reader to judge the results for him/herself? Are the results internally consistent i.e., do the numbers add up properly, can the various tables be reconciled? Are the results consistent with other studies?

θ Analysis

Are the data worthy of statistical analysis? If so, what types of tests were performed and are they appropriate for the type of measures, data and study design? Have statistical tests been performed to rule out chance? Depending on the study design, does the analysis adjust for age, gender, or other confounding factors?

θ Conclusions

Which conclusions are justified by the study results and which are not? Are the conclusions relevant to the original questions posed by the investigators?

θ Implications

What are the implications of this research? What impact does this study have on the medical/scientific/public health, regulatory and business sectors?
Successful completion of ENV446/OSH 446-Industrial and Environmental Toxicology demonstrates competency in the following outcomes-based ABET accreditation criteria:

1. Ability to apply knowledge of science
2. Ability to analyze and interpret toxicological data
3. Ability to systematically identify and quantitatively evaluate hazardous exposures
4. Knowledge of contemporary health issues as they relate to poisonous chemicals
5. Proficiency in written and oral communications
6. Knowledge of health and safety fundamentals
7. Competency in health and safety program evaluation and management
8. Competency in the toxicological analysis of spills resulting in injuries and accidents
9. Competency in the measurement of safety performance