### Course number and title:
26-TOX-878 Applied Risk Assessment

### Credits:
2

### Instructor(s) in-charge:
Jon Reid, Ph.D.

### Course type:
Lecture Laboratory Field Projects

### Required or Elective:
Required

### Course Schedule:

<table>
<thead>
<tr>
<th>Course Schedule</th>
<th>Lecture: 2 hours per week</th>
<th>10 meetings</th>
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<tbody>
<tr>
<td>Discussion:</td>
<td>6 hours per week</td>
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<tr>
<td>Office Hours:</td>
<td>6 hours for informal discussion</td>
<td></td>
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<tr>
<td>Outside Study:</td>
<td>6 hours per week</td>
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<tr>
<td>Office Hours:</td>
<td>as needed</td>
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### Course Assignments:

<table>
<thead>
<tr>
<th>Course Assignments</th>
<th>Homework: 8 assignments</th>
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<tbody>
<tr>
<td>Exams:</td>
<td>2 midterms / finals</td>
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### Grading Policy:
Final grades are calculated from scores from the midterm, final exam (term project) and homework/class assignments.

### Course Prerequisites:
none

### Catalog Description:
(taken from the graduate handbook)
Topics include exposure-response, dose-response, risk characterization of carcinogenic and non-cancer outcomes, and uncertainty assessment.

Computer program such as Crystal Ball and GIS-ArcView are used to evaluate risk using real-world scenarios for lead and organic solvents.

### Textbook and Any Related Course Materials:
The Course is based on EPA's Human Health Risk Assessment Guidelines, [http://www.epa.gov/risk/guidance.htm](http://www.epa.gov/risk/guidance.htm). Optional textbooks are:

### Blackboard:
Lecture notes, class/homework assignments and answers are posted on the blackboard

### Topics Covered / Duration:
(Provide a listing of the topics covered and the duration. This may be a list of the lectures/presentations)
- Fundamentals of human health risk assessment (risk concept, risk assessment framework, and IRIS) – 2 classes
- Hazard identification/Assessment – ½ class
- Exposure assessment – 1 class
- Dose response-Assessment for carcinogenic and non-cancer endpoints – 1 class
- Probabilistic & Deterministic approach for risk assessment (Excel, Crystal Ball, and Monte Carlo simulation) 1½ classes
- Risk characterization for carcinogenic and non-cancer outcomes -2 classes
- Risk Assessment for chemical mixtures – ½ class
- Risk Assessment for Pathogens – ½ class
- GIS in risk assessment – 1 class
Course objectives (and program outcome):

1. describe various approaches to risk assessment (H1)
2. discuss the rationale for modeling risk (D1)
3. describe resources to obtain information regarding the inputs to an assessment: toxicity, exposure, time course, receptor status. (C1, D1, D5)
4. calculate subchronic RfC and chronic RfC, develop slope factors. (E, H2)

Relation to Program Educational Objectives: This is a required course for all HSAT students. The course contributes to the following Program Educational Objectives, as shown:

- _X__Fundamental Knowledge
  - Hygiene Science _20% ; Basic Science _40%.
- _X_ Design Skills _20%
- _X_ Professional Skills _15%
- _X_ Life-long Learning _5%

NOTE: We will define Hygiene Science as all the Knowledge Elements in our list other than the Basic Sciences; Design skills are the technical skills in our list, while the Professional skills are those that involve teams, management, leadership, written and oral communication, approach to stakeholders and ethics—refer to listing in What We Teach).

Is there a TA? Yes  No

Computer use? Yes  No

For each ABET Program Outcome (a through 1), the EOH Educational Outcomes are shown below. Upon completion of this course, students will have had the opportunity to acquire knowledge (K), skills (S) and attitudes (A) associated with each of the Educational Outcomes, as noted. Where the educational measurable outcome contributes strongly to the ABET Program Outcome, the K/S/A is shown in upper case; where the contribution is average, the k/s/a is shown in lower case letters. (Note, use the Contribution to Knowledge and Professional Skills estimates above to guide your decision. If the % is 50 or more, I’d use upper case.)

A. Identify agents, factors and stressors generated by and/or associated with defined sources, unit operations and/or processes:

   Identify potential health hazards of workplace processes and operations

   K  S  A  k  s  a

B. Describe qualitative and quantitative aspects of generation of agents, factors and stressors:

   Understand and describe the underlying processes of the generation of hazards in occupational settings

   K  S  A  k  s  a

   Describe qualitative and quantitative aspects of hazards associated with specific occupational or environmental sources

   K  S  A  k  s  a

C. Understand physiological and/or toxicological interactions of physical, chemical, biological and ergonomic agents, factors
and/or stressors with the human body:

Recognize the potential for differences in response to hazards due to personal factors among some subjects at risk of exposure and the subsequent need to modify programs and practices

D. Assess qualitative and quantitative aspects of exposure assessment, dose-response, and risk characterization based on applicable pathways and modes of entry:

Understand how to evaluate potential adverse outcomes of chemical or physical exposures, based on similarity of the exposure to documented hazards

Examine occupational hygiene aspects of emerging technologies

Understand the basic principles of exposure assessment and evaluation of engineering and non-engineering controls

Develop and implement an exposure assessment plan to evaluate potential hazards and controls that are in place

Gather, manage and analyze quantitative (e.g., measurements of exposure or system performance) and qualitative (e.g., written programs) data

E. Calculate, interpret and apply statistical and epidemiological data:

Apply epidemiologic and/or statistical concepts to the interpretation of exposure data

F. Recommend and evaluate engineering, administrative and personal protective equipment controls and/or other interventions to reduce or eliminate hazards:

Identify and recommend appropriate methods to reduce exposure (using engineering controls, personal protective equipment or administrative controls), or deficiencies in written programs and policies

Design work process/practice interventions

Display effective leadership

G. Demonstrate an understanding of applicable business and managerial practices:

Produce accurate written descriptions of occupational processes and activities, exposure assessment plans and evaluation of occupational and environmental work settings

Describe approaches to interact with higher-level decision makers in various management structures

Manage resources effectively
H. Interpret and apply applicable occupational and environmental regulations:

   Understand, interpret and apply occupational and environmental regulations
   K  S  A  k  s  a

   Apply guidelines, standards and laws in the interpretation of quantitative and qualitative data
   K  S  A  k  s  a

I. Understand fundamental aspects of safety and environmental health

   Apply the professional code of ethics to a scenario
   K  S  A  k  s  a

J. Attain recognized professional certification

   Understand the importance of ethics in the practice of occupational and environmental hygiene
   K  S  A  k  s  a

   Understand the need for and resources available for continuing professional development after graduation
   K  S  A  k  s  a

K. Conduct a research activity resulting in a report that demonstrates mastery of the subject and high level of professional and public communication skills

   Design a research question, develop a plan and conduct research
   K  S  A  k  s  a

   Communicate effectively with a variety of stakeholders (e.g., labor, management, government, peers, safety and health professionals, allied professionals)
   K  S  A  k  s  a

   Produce a technical scientific report on research
   K  S  A  k  s  a

L. Demonstrate advanced qualitative and quantitative problem-solving skills

   Function effectively as part of a multidisciplinary team
   K  S  A  k  s  a

COURSE MATERIAL AND AVAILABILITY

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<tr>
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<th>Students</th>
<th>Instructors</th>
<th>TA</th>
<th>Division</th>
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<tbody>
<tr>
<td>Course Objectives/outcomes</td>
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<td>Lecture notes, assignments</td>
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