University of Alberta

Course Guide for PHS 522
Fall 2013

University of Alberta
North Campus

Principles of Toxicology

Thursday, 4:00-6:50 p.m.
ECHA 2-131

Instructor: Keith B. Tierney

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Email: keith.tierney@ualberta.ca
Office: Zoology 718, Biological Sciences Building
Course Description

*3 (fi 6) (either term, 3-0-0). This course is geared to health care professionals who need to understand the basic principles of toxicology, to appreciate the physiological and/or biochemical mechanisms underlying target organ toxicity, and to able to make initial qualitative risk assessments on the potential toxicity of agents. It will emphasize toxins in the work and home environment.

Objectives

Upon completion of this course, students will be able to:
Understand how contaminants of synthetic and natural origins will affect life, with a major emphasis on human life, over brief to extended timeframes, and to be able to predict contaminant-mediated effects arising from various exposures.

Competencies

• Describe the direct and indirect human and ecological health ramifications of chemical exposures.
• Develop an awareness of the effects of chemicals from the molecular to the population level.

Library

The University of Alberta library system’s website www.library.ualberta.ca details the range of services offered to students on and off campus.

If you need further information or assistance, contact the Library's Electronic Reference Desk at www.library.ualberta.ca/ereference/index.cfm or call 1-800-207-0172.
Course Evaluation

Mid-Point Course Evaluation: As is the case with all SPH instructors, we are interested in improving the course. We need to hear from you in order to do that well, so we will gather feedback and recommendations from you at the mid-point of the course, by asking a student to administer and deliver an anonymous course evaluation.

Final Course Evaluation:

Following completion of the course, you will receive a standardized summative evaluation. The standard University of Alberta course evaluation procedure will be followed. This will involve a standard questionnaire with anonymous responses returned to the Student Services Coordinator.

Student Evaluation

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>20%</td>
<td>Set during the course</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
<td>During the course</td>
</tr>
<tr>
<td>Term Paper or Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal:</td>
<td>5%</td>
<td>Oct 2, 4:00 pm</td>
</tr>
<tr>
<td>First draft (optional*):</td>
<td>10%</td>
<td>Nov 6, 4:00 pm</td>
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<tr>
<td>Final:</td>
<td>15%</td>
<td>Nov 28, 4:00 pm</td>
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<tr>
<td>Final Exam (3 hrs)</td>
<td>40%</td>
<td>Dec 11, 4:00 pm</td>
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*I will evaluate a draft if you wish. If not, the % will be transferred to the final report.

Evaluation of Course Work

Evaluation criteria will be provided with each assignment and the final exam.

Lecture material

The slides of this course will be posted on the web through the course’s website as PDF files, generally the night before class. It is recommended that you download and/or print them off before coming to class. Slides may require you to fill in blanks or draw figures. Also, you will be expected to make notes on the sheets from verbally communicated material. Should you miss class, it will be your responsibility to get the appropriate notes from your colleagues. Even with the complete slides, please note critical material conveyed verbally in class may be missed. Please get a friend in class! I TEST WHAT WE TALK ABOUT IN CLASS. You will NOT be
tested on material that was not discussed in class.

**Presentation**
Student led discussions of topical papers will be scheduled for 30 min each. Students will present the background to a paper (i.e. the reasons it is interesting, background needed to understand/appreciate the study, and principle aims of the study) using PowerPoint of duration 10-15 minutes. The presenter will then lead the entire class on an in-depth review of the paper, including selected questions. Students are required to meet with me on the Friday prior to their presentation to preview the slides and resolve any matters of confusion arising from the literature. The instructor will lead the first week’s discussion and possibly others, space permitting.

Presentation will be marked out of 20:
10 Visual & verbal presentation
10 Guiding discussion & questions

**Discussion & Questions**
Each week students will be required to bring at least one typed question derived from the weekly paper we are reading (except the first week). The question can be either for clarification of material, about the “bigger picture” of the scientific work, or nearly anything else. Students will be called upon randomly to address their question to the presenter, who will lead discussion of the question amongst the group. These questions and at least one possible answer will be due by the end of class.

Expectations for students:
1. Complete reading assignment prior to class.
2. Typed question (Q) with one printed copy brought to class.
3. A handwritten answer to your question based on class discussion.

10 points are possible per week: 5 for your typed question prepared before class and 5 points for participating in the class and submitting the answer at the end of class.
0 = no response
1 = incomplete assignment (<50%)
2 = incomplete assignment (>50%)
3 = Question taken directly from paper without synthesis or commentary
4 = thoughtful question, but insufficient answer, or vice versa.
5 = thoughtful question and strong answer

The instructor will make note of the extent of participation by each student, each class. A student achieving full marks will contribute to discussions every class with at least one insightful question.

Assignments are due at the end of class and will not be accepted after we leave the classroom, unless prior arrangements have been made or there is a documented emergency.
During the week you present your mark is automatically ‘10’.

**Term Paper (assignment option 1)**
There are four main objectives in having you submit a term paper:
1. To give you the opportunity to develop and foster your own specific interest.
2. To give you direct insight into toxicology.
3. To help you gain experience using the current primary (refereed journal) literature.
4. To give you practice in (scientific) writing.

Students will be encouraged and guided to come up with a topic that they are interesting in and that is relevant to the course. Students will come up with a title for their topic and 2-5 sentences on what they plan to write on. This will be handed in after 4 weeks. Feedback on the suitability of the topic will be provided within 1 week.

The term paper itself will be based on an analysis of how a contaminant (e.g. BPA), contaminant class (e.g. hydrocarbons), or other chemically-based risk affects (or may affect) human health. The student will get to choose the contaminant. If a student makes a compelling argument for examining a practice that has human health impact, the paper can focus on that. If a student is keenly interested in policy and wishes to write a policy-based paper, this may also be an option. I am open to working with you.

The goal of the assignment is for the student to become intimate with a complex, important issue of health, ideally one that the student is keenly interested in.

**Length**
The term paper will consist of 10 pages of text, max (borders 0.75”, font: 12 point Times New Roman, double spaced), plus one title page, and as many pages of references as necessary.

**Late assignments**
Every day you lose 10% of its value to the course.

**Term paper orientation**
I will be looking for evidence that you understand what you have read and have thought carefully and critically about how it all fits together.

Throughout, try to keep the objective in mind. You are trying to communicate to the reader:
- The basic issues and objectives of the research/problem being discussed
- The major and recent research findings that have advanced understanding of the topic
- Any controversies in the published research or the topic of interest, and why these exist
- Finally, can you put all this in context by devising some kind of model (flow chart, box diagram, etc.) that incorporates the information you present? This might not be appropriate for all topics.

**Advice regarding paper**
Selecting your essay topic: Students run into three common problems selecting an essay topic:
1. Leaving it too late.
2. Picking an inappropriate topic (one which does not deal with toxicology).
3. Picking a topic for which there is insufficient literature.

To avoid these problems, contact me prior to submitting the proposal. No ideas for a topic? You will find many by browsing through recent bound or unbound journals in the library (and see above weblinks), running a web search, or reading through a health news site (e.g. www.environmentalhealthnews.org). Also, a list of chemicals of potential concern will be provided to you.

Think you've found your topic? Carefully check out a few of the research articles and possibly news to make sure that the topic really does interest you, that you can understand the material, and that there are a reasonable number of current, related, research publications.

Reseaching your topic: Once your choice of essay topic has been approved, start reading as widely and as currently as time permits (unbound and recently bound journals section in Cameron or the Medical Libraries and pdf’s available through journal websites). You won't be able to do a good job in late November!

**Project: Community Service Learning (assignment option 2)**

Students will be given the choice of selecting a project from six possible options. The projects will allow students to interact directly with a community organization on a problem related to toxicology. Evaluation will consist of a presentation of your work and the quality of your report.

Details can be found here: [http://www.csl.ualberta.ca/Forms2.aspx](http://www.csl.ualberta.ca/Forms2.aspx).

From the site:

CSL gives students the opportunity to participate in the activities of a community agency or social action group as part of a university course. By taking part, students are connecting their education to what matters in their local communities.

Students who participate in CSL agree that reflecting on the process is key to both their learning and service. Instructors provide opportunities, through assignments and class activities, for students to critically explore the relationships between community placements, course material, and broader social issues. Students are also encouraged to seek out other ways to reflect on their CSL experiences (e.g., talk to your community supervisor, keep a journal, write creative prose, discuss your experience with friends, hang out at the host organization).

**WHY CSL?**
- Gain invaluable experience and develop personal, professional, and intellectual skills through participating in CSL.
- Develop critical thinking and problem solving skills.
• Improve ability to handle ambiguity (and be open to change).
• Develop or enhance other skills – notably in communication, collaboration, and leadership.
• Increase understanding of course material and learn to apply course material to new situations.
• Gain hands-on experience in the not-for-profit sector.
• Learn more about social issues and their root causes.

Grading

See ‘Assignments and Marking Criteria’.
The University of Alberta Grading System
The University of Alberta uses a letter grading system with a four-point scale of numerical equivalents for calculating grade point averages.

Grades reflect judgments of student achievement made by instructors. These judgments are based on a combination of absolute achievement and relative performance in a class. Some instructors assign grades as intervals during the course and others assign marks (e.g. percentages) throughout the term and then assign a letter grade at the end. Instructors must adapt their approaches to reflect the letter grading system. Grade distribution should reflect those shown in this document. (EXEC 03 FEB 2003)

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<thead>
<tr>
<th>Grading in Graduate Courses</th>
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<tbody>
<tr>
<td><strong>Descriptor</strong></td>
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<tr>
<td>Excellent</td>
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Academic Integrity

Plagiarism is a serious offence.

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/CodeofStudentBehaviour) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

University of Alberta policy about course outline can be found in Section 23.4(2) of the University Calendar. (GFC 29 SEP 2003)
## DETAILED COURSE OUTLINE BY WEEK

### WEEK 1 [Sept 4]  Introduction and Toxicological Principles, I
Instructor: Keith Tierney
Lecture: What is toxicology?
- Course outline
- Lecture format
- Dose and concentration response curves

### WEEK 2 [Sept 11]  Toxicological Principles, II
Instructor: Keith Tierney
Lecture: Toxicity testing and ADME
- What are endpoints?
- Hormesis
- Absorption

### WEEK 3 [Sept 18]  Mechanisms of Toxic Action
Instructor: Keith Tierney
Lecture: ADME continued and MOA
- Distribution
- Biotransformation
- Excretion
- Toxicity mechanisms

### WEEK 4 [Sept 25]  Endocrine Disrupting Compounds (EDCs)
Instructor: Keith Tierney
Lecture: The diverse world of EDCs
- Review: endocrine system
- How do EDCs work?
- Example case studies
Discussion: EDCs
Required Readings
- A topical paper TBA

### WEEK 5 [Oct 2]  Neurotoxicology
Instructor: Keith Tierney
Lecture: Neurotoxic compounds and their mechanisms
- Review: nervous system
- How do neurotoxins work?
- Example case studies
Discussion: neurotoxins  
Required Readings  
- A topical paper TBA

WEEK 6 [Oct 9]  Metal toxicology  
Instructor: Keith Tierney  
Lecture: Toxic and necessary metals  
- History: toxic metals through the ages  
- Mechanisms of toxicity  
- Example case studies  
Discussion: Metal toxicity  
Required Readings  
- A topical paper TBA

WEEK 7 [Oct 16]  Immunotoxicology  
Instructor: Keith Tierney  
Lecture: The immune system and chemicals  
- Review: components of the immune system  
- Common types of immune changes  
- Example case studies  
Discussion: immunotoxicology  
Required Readings  
- A topical paper TBA

WEEK 8 [Oct 23]  Developmental & Reproductive Toxicology  
Instructor: Keith Tierney  
Lecture: The sensitive time windows of life  
- Irreversible toxic change  
- Example case studies  
Discussion: Developmental toxicity  
Required Readings  
- A topical paper TBA  
- A topical paper TBA

WEEK 9 [Oct 30]  Nanotoxicology  
Instructor: Keith Tierney  
Lecture: Small, the difficult and the deadly?  
- How are they classified?  
- What types of toxicity do they cause?  
Discussion: Nanotox and nanotech in the future
Required Readings
- A topical paper TBA

WEEK 10 [Nov 6]  Ecotoxicology
Instructor: Keith Tierney
Lecture: The environment, life and persisting chemicals
- Persistent organic pollutants
- Bioconcentration and magnification
- Example case studies
Discussion: Ecotoxicology as it relates to mammals
Required Readings

WEEK 11 [Nov 13]  Risk Assessment (RA)
Instructor: Keith Tierney
Lecture: Predicting danger to life
- What information is needed?
- Problem formulation
- Example case study
Discussion: RA and its application
Required Readings
- A topical paper TBA

WEEK 12 [Nov 20]  Discussion on select topics
Instructor: Keith Tierney
Lecture: Topic to be decided by the class
Discussion: TBA
Required Readings
- Optional: a topical paper TBA

WEEK 13 [Nov 27]  Review lecture
Instructor: Keith Tierney

Schedule at a Glance

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Instructor</th>
<th>Assignment</th>
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<tr>
<td>9/4</td>
<td>Toxicological Principles, I</td>
<td>K. Tierney</td>
<td>-</td>
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<tr>
<td>9/11</td>
<td>Toxicological Principles, II</td>
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<tr>
<td>9/18</td>
<td>Mechanisms of Toxic Action</td>
<td>K. Tierney</td>
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</tr>
<tr>
<td>9/25</td>
<td>Endocrine Disrupting Compounds</td>
<td>K. Tierney</td>
<td>Yes</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Instructor</td>
<td>Notes</td>
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<td>10/2</td>
<td>Neurotoxicology</td>
<td>K. Tierney</td>
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<tr>
<td>10/9</td>
<td>Metal toxicology</td>
<td>K. Tierney</td>
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</tr>
<tr>
<td>10/16</td>
<td>Immunotoxicology</td>
<td>K. Tierney</td>
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<tr>
<td>10/23</td>
<td>Developmental &amp; Reproductive Toxicology</td>
<td>K. Tierney</td>
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<td>10/30</td>
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<td>K. Tierney</td>
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<td>K. Tierney</td>
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<td>K. Tierney</td>
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<tr>
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<td>Discussion on select topics</td>
<td>K. Tierney</td>
<td>TBA</td>
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<tr>
<td>11/27</td>
<td>Review</td>
<td>K. Tierney</td>
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