Environmental Health and Disease

Fall 2011

BIOL 1820

Brown/Pfizer Master of Arts Program in Biology

This course does not fulfill a core course requirement

Instructor: Michelle Embree Ku
Course Time: Tuesdays 3:30-6:30
Office Hours: following lectures or by appointment
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203-364-9862

Course Description

Humans have a long history of trying to understand and control how the environment affects their physiology. From the ancient Romans’ appreciation of sewers and aqueducts to current interest in nanoparticles’ influence on human health, there has been the desire to manage our environment to better our health. Today, the issues surrounding environmental health are complex and understanding them involves a multidisciplinary approach, using principles from toxicology, pathology, epidemiology and risk assessment, to name a few. Additionally, ethical, legal, and social issues must be considered. Environmental Health and Disease (BIOL 1820) will introduce students to the fundamental science that helps to guide public policy and individual decisions about human exposure to environmental insults, whether the insult is natural or manufactured. Topics covered will include:

- Environmental Toxicology: how the body reacts to environmental insults
- Environmental Epidemiology
- Sources of exposure: physical, chemical, and biological agents
- Risk management, ethical considerations and policy making
- Risk communication and the media
- Emerging issues in Environmental Health and Disease
Course Objectives
It is expected that during the course of study, students will:

1. gain an appreciation of the basic principles of toxicology, epidemiology, and risk assessment.
2. understand the sources of human exposure to environmental risks
3. be able to critically examine the science that determines public policy and individual decisions about how we interact with our environment

Ideal Student Background
Because environmental health sciences include many fields of study, the course will take a multidisciplinary approach. While courses in biology, molecular biology, pathology, histology, biochemistry, epidemiology, organic chemistry, and cell biology are all relevant, it is not expected that students will have taken all of these courses. Students will find that the more of these courses that they have taken, the more they will get out of this course.

Required Reading
There are two recommended textbooks:


Review and research papers required for background reading and homework completion are available through Brown Library and will be available on the MyCourse website.

Attendance
Attendance is expected at all classes. Because there is no required textbook, the lectures will weave together different sources. Students will be responsible for material covered in class. Therefore, participation is in your best interest.

Academic Integrity
Students should be aware that plagiarism will not be tolerated. Plagiarism entails appropriation of passages, words and phrases without credit, appropriation of both main and supporting ideas without credit, and paraphrasing without credit. Plagiarism also includes submitting a paper written by someone else. Ethical research requires that you properly document the sources you use. Even when you do not quote directly from another work, if reading that source contributed to the ideas presented in your paper, you should give the authors proper credit. If you have questions about when or how to cite your sources appropriately, please speak to the professor.
Logistics

Lectures: The course will consist of 14 meetings of approximately 3 hours each.

Reading: Background reading that supports lecture content will be noted on the syllabus next to the lecture. Additionally, there will be original research and/or review papers which will be required reading for class discussion and homework assignments.

In-class hourly exams: There will be two one-hour, in-class exams. These exams will cover the first and second parts of the course. They will be worth up to 100 points each.

In-class final: The first part of this exam will consist of questions dealing exclusively with the third section of the course for a possible 50 points. The remaining 50 points will be based on short answers in response to a case study.

Case study report: Students will critically evaluate a specific topic for a possible 100 points. A list of possible topics and expectations for the report will be provided. Alternatively, students may submit a topic of interest for approval.

Homework: Primary research and review papers will be discussed during many of the classes. One or two papers will be chosen as the focus of each of these discussions. The goal is to use these papers to illustrate important concepts in Environmental Health research and encourage critical evaluation.

To encourage you to be prepared to ask and answer questions about the papers during class, ten times during the semester, students will be required to submit questions regarding the primary literature assigned. The questions must be e-mailed to me at michelle_ku@brown.edu 24 hours in advance of the class. Questions will be evaluated based on their relevance for class discussions.

10 possible points for each week

(As a bonus, 5 extra points for each question that is chosen for discussion or as a test question can be earned. These points will be added on to your total points earned for the course – that is, they are a bonus.)

Grading: Final grades will be based upon the total number of points accumulated out of 500:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>Homework</td>
<td>100 pts</td>
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<tr>
<td>Exam I</td>
<td>100 pts</td>
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<td>Exam II</td>
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<td>Exam III</td>
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<td>Case Study</td>
<td>100 pts</td>
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<tr>
<td>Total</td>
<td>500 pts</td>
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Lecture Schedule

Part I: Principles of Toxicology
1: September 6
   Introduction to the Course
   Environmental Health History
   Dose Concepts
2: September 13
   Environmental Toxicology: target organs
3: September 20
   Fertility
   Endocrine Disruption
4: September 27
   Development
   Genotoxicity and Epignetics

Part II: Sources of Exposure
6: October 11
   Zoonotic and Vector-borne Disease
   Toxic Metals and Elements
7: October 18
   In-class exam on Principles of Toxicology: lectures 1-5
   Pesticides and Other Organic Chemicals
8: October 25
   Ionizing and Nonionizing Radiation
   Occupational Exposures
9: November 1
   Food
   Air
10: November 8
    Water
    Medical treatment/procedures

Background reading
1. Course Syllabus
2. Essentials of Environmental Health, Friis: chapter 1
3. Principles of Toxicology, Stine: chapters 1-3
4. Principles of Toxicology, Stine: chapters 4 and 8-12
5. Principles of Toxicology, Stine: pages 117-129
9. Principles of Toxicology, Stine: chapter 6
10. Essentials of Environmental Health, Friis: chapter 2
12. Essentials of Environmental Health, Friis: chapter 5
13. Essentials of Environmental Health, Friis: chapter 6
14. Essentials of Environmental Health, Friis: chapter 7
15. Essentials of Environmental Health, Friis: chapter 8
16. Essentials of Environmental Health, Friis: chapter 13
17. Essentials of Environmental Health, Friis: chapter 11
18. Principles of Toxicology, Stine pages 305-313
19. Principles of Toxicology, Stine pages 313-326
20. Principles of Toxicology, Stine chapter 15
Part III: Applications of Environmental Health

11: November 15

Population and the Environment


Environmental Policy, Regulation & Justice

1. Essentials of Environmental Health, Friis: chapter 4

12: November 29

In-class exam on Sources of Exposure: Lectures 6-10

Risk communication and the media


13: December 6

Future Directions


14: December 13

In-class exam on Applications of Environmental Health: Lectures 11-13

December 20

No class - Case study report due
1. Read the assigned papers. You are encouraged to look beyond the information in the paper, whether it involves looking up definitions, reading text books, or reading related papers by the same authors or authors with opposing views. I expect it to take several hours to read and re-read the papers.

2. Note any limitations or extensions you see for the ideas in the paper. For the purposes of this class, unless you have a particular interest and background in statistics, you can assume that the statistics are appropriate for the experiment.

3. Note your opinion of the paper; primarily, the quality of the ideas and its potential impact.

4. Formulate questions that could spark discussion based on your observations. If there is more than one paper assigned, your questions should be derived from at least two separate papers.

5. E-mail four questions to michelle_ku@brown.edu by the date indicated on the homework list.
Reading Assignments for BIOL1820 Homework

Questions due on September 13 for September 14 discussion: (dose concepts and EH history)


Questions due on September 20 for September 21 discussion: (target organ toxicity)


Questions due on September 27 for September 28 discussion: (fertility and endocrine disruption)


Questions due on October 4 for October 5 discussion: (dvt., genotoxicity and epigenetics)


Questions due on October 11 for October 12 discussion: (carcinogenesis and epidemiology)


For an interesting read (but not part of the homework):
Questions due on October 25 for October 26 discussion: (pesticides)


Questions due on November 1 for November 2 discussion: (radiation and occupational exposure)


Questions due on November 8 for November 9 discussion: (food and air)


Questions due on November 15 for November 16 discussion: (water and medical)


Questions due on December 6 for December 7 discussion: (population, policy regulations and justice)
