Course Title: Environmental Exposure Measurement and Assessment
Course Number: ENOH 0695
Course Location: SPH Room TBA
Course Date & Time: Monday 6:10 PM – 9:00 PM
Course Instructor: Qingyu Meng, Ph.D.
Assistant Professor
Department of Environmental and Occupational Health
Rutgers School of Public Health, Room 311
(732-235-9754; MengQi@sph.rutgers.edu)

Clifford Weisel, Ph.D.
Professor
Department of Environmental and Occupational Medicine
Rutgers School of Public Health

Office Hours: Before and after class, and by appointment
Course Assistant: NA


Additional/Supplemental Readings/Resources: Reading materials will be distributed in class.

Course Description: This course is a required elective course for MPH students in Rutgers School of Public Health and for the Exposure Science doctoral program jointly sponsored by Department of Environmental Science and the Graduate School of Biomedical Science of Rutgers. This course provides students basic scientific knowledge of sources of exposure, exposure measurement and assessment, and prevention and mitigation of hazardous environmental exposure. Topics include basic concepts of exposure science, the specific types and sources of environmental agents that people are exposed to, specific exposure measurement and assessment methods, and emerging environmental exposure issues. Skills
will also be developed for designing exposure studies applicable to epidemiologic investigations
and health risk assessment.

**Selected Department Competencies Addressed:** Each Department identifies competencies
for each degree offered. The competencies addressed in this course for the PhD for the
Department of Environmental and Occupational Health include:

- Design a testable hypothesis and execute research activity to investigate the effects of a
toxicant, or toxin, or hazard event in a community;
- Explain the importance of differences of susceptibility and vulnerability to environmental
toxicant/toxins based upon age, gender, race, ethnicity, genetics and socioeconomic
status in different populations;
- Provide an informed expert opinion to government and/or community leaders regarding
the extent or level of risk associated with a particular environmental or occupational
hazard or condition;
- Explain basic principles in environmental and occupational health sciences including
toxicology, quantitative risk assessment, epidemiology, and exposure science; and
- Develop and/or apply novel and cutting-edge research methods in the laboratory and/or
in the field.

The competencies addressed in this course for the DrPH for the Department of Environmental
and Occupational Health include:

- Determine what risks are present in a particular community and develop a basic risk
assessment plan for the identification, characterization, management, and remediation
of that risk;
- Diagnose and apply appropriate approaches for assessing, preventing, and controlling
environmental hazards that pose risks to health and safety;
- Develop an intervention/prevention plan to ameliorate a particular environmental or
occupational risk in a community workplace, respectively;
- Provide an informed expert opinion to government and/or community leaders regarding
the extent or level of risk associated with a particular environmental or occupational
hazard or condition;

Please visit the Department webpages on the School of Public Health’s website at
http://sph.rutgers.edu/ for additional competencies addressed by this course for other degrees
and departments.

**Course Objectives:** By the completion of this course, students will be able to:

- Understand the basic concepts of exposure science.
- Understand principles and methodologies of exposure analysis.
- Develop effective exposure assessment strategies for human health studies and human
health risk assessment.
- Be aware of the modeling tools for quantifying exposures.
- Be able to select or use proper techniques to measure or estimate human exposures.
Course Requirements and Grading:

- Activities, assignments, projects, exams, etc. that contribute to course grade, and the respective point/percentage value of each.

  Class Participation 10 points  
  Homework 30 points (Late: -5 points/day)  
  Midterm 25 points  
  Group Project and Presentation 35 points (Late: -5 points/day)

  Additional details about the course’s projects and assignments will be provided during the semester.

- Grading scale.

  A (points ≥ 90); B+ (80 ≤ points < 90); B (70 ≤ points < 80);  
  C+ (65 ≤ points < 70); C (60 ≤ points < 65); F (points ≤ 59)

Course Schedule:

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<th>Class</th>
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<td>1</td>
<td>Course Introduction and Basic Principles</td>
<td>Weisel</td>
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  Source-to-health conceptual paradigm  
  Definition of exposure  
  Exposure route  
  Exposure pathway  
  Exposure estimates  

  Reading Material: Chapters 1 and 2
2 Exposure Classifications and Exposure Factors  Meng

Classifications of exposure
Exposure factors
Exposure factors handbook

Reading Material: Chapters 4
Homework 1 is Assigned.

3 Bio-monitoring of Exposure  Stern

Biomarkers
Biomarker development and measurement
National biomonitoring program
Application of biomarkers in exposure assessment

Homework 1 is due.

4 Inhalation Exposure Assessment  Weisel

Major pollutants of concern
Microenvironments
Exposure components
Inhalation exposure estimates

Reading Material: Chapters 5, 6, and 7
Homework 2 is assigned.
5  Dermal Exposure and Multimedia Exposure Assessment  Fan
   Dermal exposure and dose
   Mechanisms and pathways for dermal exposure
   Exposure measurement method
   Reading Material: Chapters 11-16
   Homework 2 is due.

6  Ingestion Exposure  Weisel
   Sources of exposures and contaminants
   Dietary Ingestion
   Non-Dietary Ingestion
   Exposure measurement methods
   Reading Material: Chapter 13

7  Microbial Exposure Assessment  Tsai
   Microbial exposure concepts
   Mechanisms and pathways for microbial exposure
   Exposure measurement methods
   Reading Material: To be distributed in class
8 MIDTERM EXAM (Close book)(6:20-9:10pm) Fan

Reading Material: Chapter 17

9 Exposure for Catastrophic Event Weisel

A scientific framework
Exposure and health
Exposure science in future catastrophes


10 Methods for Time Activity Black

Overview
Questionnaire design
Questionnaire administration
Global Position System
Data analysis

Reading Material: Freeman et al., Chemosphere, 2002
Homework 3 is assigned.
11 **Mathematical Modeling of Exposure**

Overview of exposure modeling

Rationale and application of exposure modeling

Types of exposure and environmental models

Reading Material: Chapter 18 and 19

Homework 3 is due.

12 **Mathematical Modeling of Exposure - continue**

Application

Variability and Uncertainty

Reading Material: Chapter 19 and 20

13 **Designs for Human Exposure Assessment Studies**

What is an environmental exposure study?

Exposure determinants

Distributions of exposure

Study design

Ethical issues in exposure studies

Reading Material: Chapters 3

*Take home final exam is assigned.*
14  Exposure Assessment in Risk Assessment  Meng

- Risk assessment
- Uncertainties in exposure assessment
- Exposure error and its impact
- Cumulative and aggregate exposure assessment


15  Final exam-Term Project Presentation  Weisel and Meng

**Final exam is due.**

**School of Public Health Honor Code:** The School of Public Health Honor Code is found in the student bulletin (sph.rutgers.edu/academics/catalog/index.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another’s work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the school community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

**Policy Concerning Use of Recording Devices and Other Electronic Communications Systems:**
When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.