

Department of Environmental Health
Faculty of Health Sciences
American University of Beirut

ENHL 311 (3 cr.)
Human Health Risk Assessment
Spring semester AY 2023 - 2024

Course Instructor:

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Office hours: MW 11:30am-12:30

Class time and location:

Dates, times: **MW 3:00 - 4:15 pm**

Classroom: Room 332, Van Dyck Hall

Course description:

Thousands of chemicals are currently in common use and hundreds are introduced newly every year. The toxic effects of these compounds on humans are of significant public health concern. Human health risk assessment (HHRA) studies the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media. HHRA is an essential basis for decision-makers in remediation of environmental contamination and public health protection. This course introduces students to concepts, sources of data, and methods, which are used in the field of human health risk assessment, and provide them with an understanding of current issues in this field. The course examines in detail the four components of risk assessment: hazard identification, dose-response evaluation, exposure assessment, and risk characterization. Additionally, concepts in risk management and risk communication are discussed. The course includes lecture-style presentations, in-class exercises and assignments, and student led discussions of reports/articles. Students will obtain enough experience to be able to successfully evaluate a health risk assessment report, which will be demonstrated in the final student presentations.

Course learning objectives

By the end of the course, students will be able to:

1. Describe components of a human health risk assessment
2. Use data sources for hazard assessment and hazard characterization
3. Demonstrate an understanding of the main methods used in exposure assessment
4. Explain how health-based standards are generated
5. Develop a health risk assessment document using available data on human chemical exposure
6. Categorize uncertainties and sources of variability in risk assessment
7. Critique a health risk assessment report

Required readings

K. Asante-Duah. *Public Health Risk Assessment: for Human Exposure to Chemicals*. 1st Kluwer Academic Publications, 2002. ISBN-13: 978-1402009211.

Course requirements and student evaluations:

Students will be evaluated on the following:

Midterm examination assessing SLOs 1-4:	35%
HRA Classroom Assignments SLOs 5 and 6:	25%
Student Presentation assessing SLO 7:	35%
Class Participation	5 %

Graded Classroom Exercises

Students are expected to engage in graded HRA classroom exercises according to provided instructions. Students are expected to complete a number of the following tasks as part of the assigned task:

- Interpret provided toxicity data to identify the existence of a chemical hazard
- Use provided exposure data to evaluate and estimate human exposure
- Estimate toxic hazards and non-carcinogenic risk to human health
- Discuss uncertainty and variability issues

Student Presentation Topic

The aim of this exercise is to train students on analysing a health risk assessment report. Each student or group is expected to prepare a PowerPoint presentation on a risk assessment topic selected from a provided list of topics to be shared at the beginning of the term, *or suggest other topics subject to the course coordinator's approval*. All students should be prepared to present chosen topic to the class on the designated day. The presentation should be no longer than 45 min, and should cover the following aspects:

- Describe the physical and chemical properties of the agent briefly. Its occurrence and use. Only information relevant for the risk assessment should be presented.
- Describe the kind of exposure(s) considered, most highly exposed group, how the exposure was assessed, what kind of data was available for assessment (environmental levels, human levels, models). How was the assessment performed?
- Report data on genotoxicity and carcinogenicity of the studied agent.
- Describe the key study elements and experimental design in the critical study
- Identify the critical effect(s), why was this effect selected?

- Report how was the extrapolation of risk to humans performed. What was the starting point? What uncertainties were considered? What safety coefficients were used?
- Describe the Risk Characterization performed. What is the margin of exposure if any? What is the cancer risk if any?
- What are the uncertainties and weaknesses/gaps (if any) in the produced report?

Course Policies

Attendance

You are urged to attend all classes. In cases of technology-enhanced learning sessions, it is mandatory that you turn on your cameras. In cases of absence, you are responsible for the material missed and for any announcement made. Students who miss more than one-fifth of class sessions are subject to withdrawing from the course (W) as per the University policy, unless the University suspends this policy.

Academic Integrity

Education is demanding and time management is essential. Do not hesitate to use the resources around you but do not cut corners. Cheating and plagiarism will not be tolerated. Please review the Student Code of Conduct in your handbook and familiarize yourself with definitions and penalties. If you are in doubt about what constitutes plagiarism, ask your instructor because it is your responsibility to know. The American University of Beirut has a strict anti-cheating and anti-plagiarism policy. Penalties include failing marks on the assignment in question, suspension or expulsion from University and a permanent mention of the disciplinary action in the student's records.

Students with Special Needs

If you have documented special needs and anticipate difficulties with the content or format of the course due to a physical or learning disability, please contact me and/or your academic advisor, as well as the Counseling Center in the Office of Student Affairs (Ext. 3196), as soon as possible to discuss options for accommodations. Those seeking accommodations must submit the Special Needs Support Request Form along with the required documentation.

Non-Discrimination – Title IX

AUB is committed to facilitating a campus free of all forms of discrimination including sex/gender-based harassment prohibited by Title IX. The University's non-discrimination policy applies to, and protects, all students, faculty, and staff. If you think you have experienced discrimination or harassment, including sexual misconduct, we encourage you to tell someone promptly. If you speak to a faculty or staff member about an issue such as harassment, sexual violence, or discrimination, the information will be kept as private as possible, however, faculty and designated staff are required to bring it to the attention of the University's Title IX Coordinator. Faculty can refer you to fully confidential resources, and you can find information and contacts at www.aub.edu.lb/titleix. To report an incident, contact the University's Title IX Coordinator at 01-350000 ext. 2514, or titleix@aub.edu.lb. An anonymous report may be submitted online via EthicsPoint at www.aub.ethicspoint.com.

Course Timetable ϕ

Session/ Date	Topic (Corresponding Student learning objective)	Content	Reading
1 M Jan 22	Course Overview	Course policies and content	Handout
2 W Jan 24	Concepts in Toxicology (2)	<ul style="list-style-type: none"> Review of major concepts and models in Toxicology in relation to Risk Assessment 	Handout
3 M Jan 29	Environmental Chemical exposure (1/2)	<ul style="list-style-type: none"> Potential environmental Exposures Required data for HRA 	Chapter 2
4 W Jan 31	Introduction to Risk Analysis (1)	<ul style="list-style-type: none"> Overview of the components of Risk Assessment Fundamental concepts 	Chapter 3 Chapter 4
5 M Feb 05	<i>Case study 1*</i> (1)		Assigned Reading
6 W Feb 07	Hazard Identification (1/2) <i>Submit Presentation Topics by email by Midnight</i>	<ul style="list-style-type: none"> Methods of toxicity evaluation Pros & Cons of models used 	Chapter 7
7 M Feb 12	Dose-Response Evaluation I: Principles (1)	<ul style="list-style-type: none"> Dose-response evaluation guidelines Animal testing ethics Defining the critical effect 	Chapter 7
8 W Feb 14	Dose-Response Evaluation II: Standards Setting (1/4)	<ul style="list-style-type: none"> Limit values vs. Guideline values Extrapolations Challenges and uncertainties TDI, RfD, DWEL 	Chapter 7 Chapter 9
9 M Feb 19	D-R Exercises	<ul style="list-style-type: none"> D-R In-class exercises I and II 	
10 W Feb 21	Human Exposure Assessment I (1/3)	<ul style="list-style-type: none"> Principles of Exposure Assessment Direct and indirect exposure assessment approaches 	Chapter 6
11 M Feb 26	Human Exposure Assessment II	<ul style="list-style-type: none"> Types & methods of environmental sampling 	Chapter 6

	(1/3)	<ul style="list-style-type: none"> Analytical methods & quality assurance 	
12 W Feb 28	Human Exposure III (1/3)	<ul style="list-style-type: none"> Quantitative exposure assessment methods Required adjustments In-class exercise 	Chapter 6
13 M Mar 04	Risk Characterization (1/4)	<ul style="list-style-type: none"> Non-Carcinogenic hazard estimation Carcinogenic risk estimation Risk acceptability Uncertainties In-class exercise 	Chapter 8
14 W Mar 06	Cancer Risk Assessment (5)	<ul style="list-style-type: none"> Evaluating carcinogenicity of individual chemicals Applying IARC guidelines In-class exercise 	Handouts
15 M Mar 11	Chemical Regulatory Agencies (1/7)	<ul style="list-style-type: none"> Introduction to chemical regulations WHO, HRA in the EU and the US 	Handouts
16 W Mar 13	<i>Review Session</i>	<ul style="list-style-type: none"> <i>Q & A on Midterm material</i> 	
M Mar 18	MIDTERM: Sessions 1-14		
17 W Mar 20	<i>Case-Study 2*</i> (7)		Assigned Reading
M Mar 25	No Class: Annunciation Day		
18 W Mar 27	Risk Management	<ul style="list-style-type: none"> Framework and cost-effectiveness analysis Risk communication The use of GIS in HRA Effect on Public Health Policy 	Handouts
M Apr 01	No Class: Latin Easter		
19 W Apr 03	Applied Risk Management	<ul style="list-style-type: none"> R-M In-Class Exercise 	
20 M Apr 08	<i>Simulation*</i> (7)	<ul style="list-style-type: none"> How to critique an HRA report PCBs 	Handouts
W Apr 10	No Class: Eid El Fitr**		
21 M Apr 15	Student Presentations (7)		
22 W Apr 17	Student Presentations (7)		

23-24 W Apr 22 W Apr 24	Student Presentations (7)
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⚠ Changes in the timetable may occur during the term

****Sessions with assigned readings to be prepared before the session***

*****Subject to change based on the Lunar Calendar***

Withdrawal period ends: **Apr 11, 2024**

Reading period begins: **Apr 29, 2024**