Course Overview and Syllabus

ESM 213: Ecotoxicology - Spring, 2017
Mon/Wed 1:00-2:15; Bren Hall 3526

Instructor
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Summary of course

Ecotoxicology is the study of the effect of environmental contaminants on living organisms - a merger of the study of the environment (ecology) with the study of interactions of chemicals with individual living organisms (toxicology). In this course, we will learn about how toxicants interact with and impact biological organisms, how ecotoxicology is measured in practice, and how to critically analyze ecotoxicological papers through case studies.

Learning objectives

By the end of this course, students will

1) Understand how toxicants interact with and impact biological organisms
   We will learn about mechanisms of toxicity, how organisms accumulate and excrete toxic compounds, and the effects of toxicants on individuals, populations, and whole ecosystems.
2) Know how ecotoxicology is measured in practice
   We will learn about standardized toxicity tests, alternative testing strategies, and the use of quantitative modeling for Ecological Risk Assessment.
3) Be able to critically analyze primary scientific literature
   Students will read ecotoxicology papers and identify important points and summary measurements for comparison within the literature on the same toxicant and between contaminants of interest. More importantly, students will be able to read these papers critically, understanding the limitations of certain measurements or assumptions and identifying potential weaknesses of the methodology or analysis.

Textbook

"Principles of Ecotoxicology" by Walker, Sibly, Hopkin and Peakall (4th edition) Amazon link

Syllabus

NOTE: This is a general syllabus that is subject to change – a final syllabus will be posted on the class' GauchoSpace page.

For each subject, the first class will mainly involve lecture on that topic and the second class will be a discussion of relevant case studies related to the topic for that week. We will be reading papers from the literature for discussion (specific papers are TBD but will be posted on GauchoSpace). PE denotes the pages of our textbook ("Principles of Ecotoxicology").

	Class #	Date	Subject	Readings
Week 1	1	Mon April 3	Introduction	
	2	Wed April 5	Major classes of pollutants	PE Ch 1
Week 2	3	Mon April 10		Case study: neonicotinoids and bees
	4	Wed April 12	Routes of entry and movement of pollutants	PE Ch 2 & 3
Week 3	5	Mon April 17		Case studies: air pollution, distribution of chemicals at the Poles, environmental distribution of nanomaterials
	6	Wed April 19	Fate of contaminants in environment	PE Ch 4
Week 4	7	Mon April 24		Case studies: bioconcentration and bioaccumulation, environmental factors altering bioavailability, use of oil wastewater to irrigate crops
	8	Wed April 26	Roger Nisbet guest lecture: "Prediction up and down levels of organization: one step at a time"	
Week 5	9	Mon May 1	Fate of contaminants in individual organisms	PE Ch 5
	10	Wed May 3		Case studies: toxicokinetic modeling, trophic transfer of nanomaterials, Ah receptor mediated toxicity (PCBs/PAHs)
Week 6	11	Mon May 8	Ecotoxicity testing	PE Ch 6, 15.3-4
	12	Wed May 10		Case studies: Ecological risk assessment, arguments for an against the NOEC, species sensitivity analysis
Week 7	13	Mon May 15	Biochemical and physiological effects; Adverse Outcome Pathway	Ch 7 & 8
	14	Wed May 17		Case studies: Endocrine disrupting chemicals (including AOP example), relating toxic effects to bioenergetics models (DEBtox)
Week 8	15	Mon May 22	Effects on populations	PE Ch 12
	16	Wed May 24		Case studies: modeling populations based on individual response to toxicants
Week 9		Mon May 29	Memorial Day	
	17	Wed May 31	Effects on communities and ecosystems	PE Ch 14 & 17
Week 10	18	Mon June 5		Case studies: effect of nanomaterials on soybeans, extrapolation of toxic effects to ecosystem services
	19	Wed June 7	"State of the Science" presentations	

Grading

1. Midterm - 20%
2. Leading class discussion - 20%
3. Paper summaries - 20%
4. State of the Science Final Project - 40% total
    a. Presentation - 10%
    b. Paper - 30%