

BIOL 475: Ecological Toxicology

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TA	Erin Maloney Erin.maloney@usask.ca
Course delivery	Lectures: MWF 11:30-12:20 Lab: T 1:30-5:20
Location	GEOL 261 (Lecture) BIOL 212 (Computer Lab)
Office hours	Happy to meet by appointment- please email
Prerequisites	BIOL 120 and 121 and BIOL 228 and 6 additional cu of senior BIOL courses and a course in statistics; or permission of the instructor. TOX 301 recommended

Course Description

This course reflects the dynamic integration of classical toxicology, ecology and environmental science. In particular, we focus on the elements and contributions of organismal, population, community and ecosystem ecology to the multidisciplinary science of ecotoxicology. Students will learn how toxicants move in the environment and how organism's life history affects their exposure. In addition to the fundamental exposure and effects on organisms, importantly you will learn how contaminants can impact populations, communities and ecosystems. We will explore some key ecological principles and concepts that you likely have encountered in other ecology courses (e.g. population theories, foraging ecology, nutrient cycling, energy allocation, competition, animal behaviour, trophic cascades, evolution) and apply them in the context of environmental contaminants.

Learning Outcomes

Upon completion of this course, students will be able to:

1. Demonstrate knowledge about the complex issues of contaminants in the environment
2. Describe the basic principles of how contaminants behave in the environment and in organisms.

3. Explain how contaminants act at multiple levels of biological organization (populations, communities and ecosystems).
4. Learn and apply quantitative models, methods and statistics to address applied ecotoxicology problems.
5. Interpret and design relevant ecotoxicology field and lab studies based on the principles and tools learned in the course.
6. Demonstrate oral and written communication skills, and critical thinking skills through independent and collaborative work.

Class Schedule and Format

The course will use the traditional lecture format of 3 lectures/week and weekly lab. While the lectures are delivered by the instructor, given the class size, I strongly encourage class participation and involvement. You will get more out of this course! Basic lecture slides (text information missing) will be posted on Blackboard prior to each class. This course is taught in conjunction with the graduate level BIOL 898 (Ecotoxicology: Theory and Practice). The lectures are shared in common between both the undergraduate and graduate course; however, undergraduate students are only required to attend the BIOL475 lab/tutorial sessions (not the additional 898 Seminars).

Computer based labs and/or tutorials will take place once a week which complement the lecture material. They are designed to encourage active thinking and improve quantitative and statistical skills with applications to real world ecotoxicology issues. Each of the 5 computer labs will involve data manipulation and analysis involving statistics and/or modeling and a written report which is due the following week before the start of the lab session by electronic submission through Blackboard (see "*Submitting Assignments*" below). Detailed grading rubrics for each lab will be given before each assignment.

There will also be 3 tutorial style labs involving lively discussions from the class on current issues in ecotoxicology using individually selected journal articles, book chapters from "Silent Spring" or based on the documentary film called "Living Downstream". The structure of each tutorial will differ to include a mock "expert panel inquiry", group discussions and inquiry based learning, and preparation of a press release. Your tutorials will be graded in collaboration with the TA based on your required written assignments, degree of preparedness (readings), and participation in the discussions. Attendance is mandatory.

Finally, there will be a group project involving splitting into small groups of environmental "consultants" tasked with designing and conducting an ecotoxicological study to address concern for a chemical and site of interest (suggested scenarios will be given at a later date). You will be required to produce an interactive poster (oral and poster) presentation which involves outlining your approach and study design for the above scenario. A detailed grading rubric will be given at the time of assignment.

Course schedule

Week	Lectures (MWF 11:30-12:20)	Lab/Tutorial (T 1:30-5:20)	¹ Readings	Assignments
Week 1 Jan 4 (classes begin Jan.6)	Intro and history of Ecotox; Role of Ecology in Ecotoxicology; Review of major principles in toxicology	no lab	Ch. 1 and 9.2	
Week 2 Jan 11	Contaminant sources; Contaminant transport and fate in Ecosystems; Exposure and uptake;	Lab 1: Exposure modeling	Ch.2, 13.3 (lab)	LAB 1 REPORT
Week 3 Jan 18	Bioaccumulation/Bioavailability; Trophic transfer and Biomagnification; Food webs	Tutorial 1-Oil sands case study articles assigned to groups for expert panel style discussion	Ch.3, 5	Attendance required; JOURNAL ARTICLE SUMMARY
Week 4 Jan 25	Scale and the Individual organism; Lethal and Sublethal Effects; Stress, Growth and Energy allocation; behaviour;	Lab 2: Bioaccumulation	Ch.8	LAB 2 REPORT
Week 5 Feb 1	Intro to Population ecotoxicology; Epidemiology, Effects on population size and dynamics;	Lab 3: Analyzing ecotoxicology data using statistics	Ch.10	LAB 3 REPORT
Week 6 Feb 8	Population models; Population demographics; MIDTERM EXAM (Feb 12)	Tutorial 2: Documentary: Living Downstream	Ch.10	MIDTERM; Attendance required; No assignment
Feb 15-19	MIDTERM BREAK - NO CLASSES	no lab	Silent Spring book	
Week 8 Feb 22	Spatial distributions of contamination; Consequences for Metapopulations;	Lab 4: Population modeling	Ch. 10	LAB 4 REPORT
Week 9 Feb 29	Intro to Community Ecotoxicology, Abiotic/Biotic factors regulating communities; Measuring community effects	Tutorial 3: Silent Spring book discussion	Ch.11	Attendance required, QUESTIONS/ARTICLE SUMMARY
Week 10 Mar 7	Indirect effects; Disturbance and recovery from pollution; Intro ecosystem ecotoxicology	Lab 5: Communities	Ch. 11	LAB 5 REPORT
Week 11 Mar 14	Contaminant effects on ecosystems; Landscape ecotoxicology; Climate change and contaminants	Designing ecotox experiments- group project	Ch.12	Attendance required
Week 12 Mar 21	Current issues in Ecotoxicology (e.g. Chemical mixtures, Multiple stressors)	Research Site visits - U of S FAAR and Aquatic Tox Facility	Assigned reading	Attendance required
Week 13 Mar 28	Current issues in Ecotoxicology; Ecotoxicology in the Regulatory context	No lab- group project work	Assigned reading	
Week 14 Apr 4	Grad Student in class guest lectures	Group Interactive Poster Presentations		GROUP ORAL/POSTER PRESENTATION
Date TBC	FINAL EXAM			

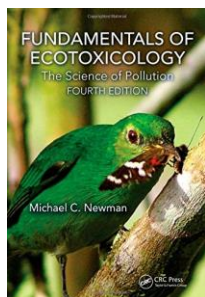
¹selected chapters from textbook Fundamentals of Ecotoxicology); other relevant journal articles and suggested readings will be given in lectures and on PAWS

Required Resources

Textbooks

Textbooks are available from the University of Saskatchewan Bookstore:

www.usask.ca/consumer_services/bookstore/textbooks



Fundamentals of Ecotoxicology: The Science Of Pollution 4th edition by Michael Newman, CRC Press, 2009 (required). Feel free to use the 3rd edition if available.



Silent Spring by Rachel Carson; originally published in 1962. Any edition. Should be able to get this book easily from any library or purchase your own copy for about \$2 on Amazon.

Alternative Recommended Textbooks

Ecotoxicology: A Comprehensive Treatment (optional) By Michael Newman and William Clements. CRC Press, 2008. Available in the library (2 reserve copies)

Grading Scheme

Student grades will be assigned using the following weightings:

*Midterm exam	20%
*Final exam	35%
Lab reports (5)	30%
Tutorials (2)	5%
Group interactive poster presentation	10%

***Students are expected to complete all exam requirements in order to pass the course.** If you are absent from the midterm or final exam due to medical emergency, death in family or an exceptional circumstance, you must provide in person or by telephone (not by email), documented evidence within 3 working days of the missed exam.

Assessments

The course is designed to give you opportunities to earn marks throughout the term. A detailed rubric with expectations/mark allocations for each assignment will be distributed to students at the time of assigning.

Lab reports 1-5

Value: 30% of final grade (5 assignments, 6% each)

Due Date: See Course Schedule (due 1 week after each lab)

Type: The regular lab assignments are designed to complement and extend the in class activities through empirical computer exercises.

Description: Students must complete the analysis of data in lab, answer questions and present the findings. You are required to submit a concise written report including all MS Excel figures and tables produced. No prescribed format for the reports, but marks are allocated on the basis of correctness, completeness and presentation.

Tutorial assignments 1-3

Value: 5% of final grade (2 assignments)

Due Date: See Course Schedule

Type: The tutorial assignments are designed to complement and extend the in class activities to develop critical thinking, oral and written skills.

Description: Each tutorial has a different format. Tutorial 1 requires the student to select a journal article related to the topic of Oil sands toxicity to fish and wildlife and present a summary orally in a class debate and in writing. Tutorial 2 will expose you to the documentary film "Living Downstream"; Tutorial 3 will involve reflecting and answering questions based on readings from Rachel Carson's book "Silent Spring" and summarizing an independently selected modern journal article related to the topic of pesticides and ecosystem health. Inherently, a portion of the grade for each of tutorial are based on the written component and another on the oral component. Attendance and participation is mandatory for full marks.

Midterm exam

Value: 20% of final grade

Due Date: Feb. 12

Type: In class seated exam (50 min)

Description: Written exam to cover all material from the start of the course (lecture and lab). Format will include multiple choice and short answer questions.

Interactive Group Poster Presentation

Value: 10% of final grade

Date: Last lab session (Apr. 5)

Type: Powerpoint poster slide and oral presentation delivered to class.

Description: Completed in groups of 3, you as consultants will research and present a study design for a client to address a chemical and site of interest (provided by instructor). The objective is to have you integrate the information from the course to highlight the methods and approaches you would use to address both exposure and effects of the chemical on individuals, populations and/or communities. Length: 15 minute oral presentation followed by 5 minutes of questions.

Final Exam

Value: 35% of final grade

Date: TBD- during final exam period

Type: Seated 3 hr exam

Description: Written exam with a combination of multiple choice, short answer and long answer (with choice) questions covering all material (lecture and lab and tutorials) in the course.

Key Dates

The following table summarizes key dates for assignments and exams.

Week	Module	Scheduled Due Date (by 1:30pm)
2	Lab 1	Jan. 19
3	Tutorial 1 (Journal article summary)	Jan. 26
4	Lab 2	Feb. 2
5	Lab 3	Feb. 9
6	MIDTERM EXAM; Tutorial 2 (documentary film- no assignment)	Feb. 12
8	Lab 4	Mar. 1
9	Tutorial 3 (Assigned questions and journal article summary)	Mar. 11
10	Lab 5	Mar. 15
14	Group Poster presentation	Apr. 5
	FINAL EXAM	TBA

Submitting Assignments

All assignments should be handed in via Blackboard in PAWS **by 1:30pm on the due date**.

Late assignments will be accepted with a 10% penalty per day. No assignment will be accepted after 3 days lateness.

Criteria That Must Be Met to Pass

Students must sit all exams to pass the course. A course average of 50% is the minimum passing grade. All lecture material, labs, tutorials, readings and film are “examinable”.

Attendance and Participation Expectations

Attendance and participation are expected for both the lecture and lab/tutorials. Participation and note taking in class is key to your learning. Attendance in labs and tutorials is mandatory. If you are unable to attend a lab due to illness, emergency, or other reasons you should notify me by email asap and make arrangements to get instructions on the material. Basic lecture material (e.g. figures) are posted on Blackboard; however, due to the nature of the course, slides will not contain all examinable content and should be supplemented by note taking. All material presented in the course both in lecture and labs/tutorials is examinable.

Student Feedback

I welcome student feedback throughout the course. There will be formal opportunities at the end of the course to offer feedback and suggestions on course design, material and delivery. Informal suggestions or comments are welcome anytime.

Midterm and Final Examination Scheduling

Midterm and final examinations must be written on the date scheduled. Final examinations may be scheduled at any time during the examination period. Students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write an alternate exam may be given. Students are encouraged to review all examination policies and procedures:

<http://www.usask.ca/calendar/exams&grades/examregs/>

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan 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 Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that 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.

All students should read and be familiar with the Regulations on Academic Student Misconduct (http://www.usask.ca/university_secretary/honesty/StudentAcademicMisconduct.pdf) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (http://www.usask.ca/university_secretary/honesty/StudentNon-AcademicMisconduct2012.pdf)

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at:

http://www.usask.ca/university_secretary/pdf/dishonesty_info_sheet.pdf

Examinations with Disability Services for Students (DSS)

Students who have disabilities (learning, medical, physical, or mental health) should register with Disability Services for Students (DSS) if they have not already done so. Students who suspect they may have disabilities should contact DSS for advice and referrals. In order to access DSS programs and supports, students must follow DSS policy and procedures. For more information, check <http://www.students.usask.ca/disability/>, or contact DSS at 966-7273 or dss@usask.ca.

Students registered with DSS may request alternative arrangements for mid-term and final examinations.

Students must arrange such accommodations through DSS by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by DSS.