

# BIOL 475: Ecological Toxicology

---

Instructor	Dr. Christy Morrissey Office: CSRB Room 120.6 Ph: 966- 4433 Email: <a href="mailto:christy.morrissey@usask.ca">christy.morrissey@usask.ca</a> Website: <a href="http://christymorrissey.driftchamber.com/">http://christymorrissey.driftchamber.com/</a>
TA	Jory Litt-Jukes
Course delivery	2021-22 Term 2 Lectures: MWF 10:30-11:20 Lab: W 1:30-5:00
Location	GEOL 161 (Lecture) Ag 1E79 (Computer Lab)
Office hours	Happy to meet by appointment or briefly after class
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. 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) will be posted on Canvas prior to each class. This course is often taught in conjunction with the graduate level BIOL 875 (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 875 meetings).

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 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 a tutorial style lab 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 "Poisoned Waters". The structure of the tutorial will differ to include a mock "expert panel inquiry", group discussions or inquiry based learning. Your tutorials will be evaluated on the 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.

## Detailed Course schedule

Week	Lectures (MWF 10:30-11:20)	Lab/Tutorial (W 1:30-5:20)	<sup>1</sup> Readings	Assessments/ Due dates
<b>Week 1</b> (classes begin Jan 5)	Intro and history of Ecotox; Role of Ecology in Ecotoxicology; Review of major principles in toxicology	no lab	Ch. 1 and 9.2	
<b>Week 2</b> Jan 10	Contaminant sources; Contaminant transport and fate in Ecosystems; Exposure and uptake;	Lab 1: Exposure Assessment	Ch.2, 13.3 (lab)	LAB 1 REPORT due Jan 19
<b>Week 3</b> Jan 17	Bioaccumulation/Bioavailability; Trophic transfer and Biomagnification; Food webs	Lab 2: Bioaccumulation	Ch.3, 5	LAB 2 REPORT due Jan 26
<b>Week 4</b> Jan 24	Scale and the Individual organism; Lethal and Sublethal Effects; Stress, Growth and Energy allocation;	Lab 3: Survival and Growth	Ch.8	LAB 3 REPORT due Feb 2
<b>Week 5</b> Jan 31	Behavioural Ecotoxicology; Intro to Population ecotoxicology; Epidemiology	Lab 4: Analyzing ecotoxicology data using statistics	Ch.10	LAB 4 REPORT due Feb 9
<b>Week 6</b> Feb 7	Effects on population size and dynamics Population models; Population demographics	Lab 5: Population modeling	Ch.10	LAB 5 REPORT due Feb.17**
<b>Week 7</b> Feb 14	Spatial distributions of contamination; Consequences for Metapopulations; Intro to Community Ecotoxicology; <b>MIDTERM EXAM (Feb 16)</b>	<b>MIDTERM</b> (in lab period)	Ch. 10	2-stage MIDTERM on Feb. 16
<b>Midterm break</b> Feb 21-25	<b>READING BREAK - NO CLASSES</b> Read Silent Spring	no lab	Silent Spring Assigned reading chapters	
<b>Week 8</b> Feb 28	Abiotic/Biotic factors regulating communities Measuring community effects; Indirect effects; Disturbance(Chemical mixtures, Plastics, nanoparticles) and recovery from pollution	Lab 6: Communities	Ch.11	LAB 6 REPORT due Mar 9
<b>Week 9</b> Mar 7	Intro ecosystem ecotoxicology; Contaminant effects on ecosystems; Landscape ecotoxicology	Tutorial 1: Silent Spring book discussion	Ch. 11	QUESTIONS/ARTICLE SUMMARY due Mar 16
<b>Week 10</b> Mar 14	Experimental Design in Ecotoxicology; Current issues in Ecotoxicology	Designing ecotox experiments- group project assigned	Ch.12	Attendance required on Mar 23
<b>Week 11</b> Mar 21	Current issues in Ecotoxicology, Climate change and contaminants	No lab- open time for group project work		
<b>Week 12</b> Mar 28	Chemical Mixtures, Regulating Chemicals	Group Interactive Poster Presentations		GROUP ORAL/POSTER PRESENTATION on Mar 30
<b>Week 13</b> April 4	Last class- Review session			
<b>Date TBC</b>	<b>FINAL EXAM</b>			

<sup>1</sup>selected 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](http://www.usask.ca/consumer_services/bookstore/textbooks)



**Fundamentals of Ecotoxicology: The Science Of Pollution** 5th edition by Michael Newman, CRC Press, 2020 (strongly recommended). Available in hard cover or as an ebook. <https://www.routledge.com/Fundamentals-of-Ecotoxicology-The-Science-of-Pollution-Fifth-Edition/Newman/p/book/9780815354024>

Feel free to use the 3rd or 4th 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 \$10 on Amazon.

## Grading Scheme

Student grades will be assigned using the following weightings:

*Midterm exam	20%
*Final exam	35%
Lab reports (6)	30%
Tutorials (1)	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 1-6

**Value:** 30% of final grade (6 assignments, 5% 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. Rubrics for each lab assignment are provided.

### Tutorials

**Value:** 5% of final grade (1 assignment, attendance/ participation required)

**Due Date:** Mar. 16

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

**Description:** Tutorial 1 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/or ecosystem health that are raised in the book. Inherently, a portion of the grade for each tutorial is based on the written component and another on the participation component. Therefore, attendance and demonstrated evidence that you have completed the readings through participation in the discussion is mandatory for full marks.

### Midterm exam

**Value:** 20% of final grade

**Due Date:** Feb. 16 (during lab period)

**Type:** 2 stage -individual and group exam

**Description:** This will be delivered as a 2-stage written exam to cover all material from the start of the course (lecture and lab). Format will include multiple choice and short answer questions written in 2 stages- 1<sup>st</sup> stage is individually written (50 min time limit). Immediately after submitting your exam, in the second stage you will be put into random groups of 3-4 students and each group will be given the chance to rewrite the same exam plus there will be 1 new bonus question (25 min time limit). The mark allocation is 90% on the individual exam, 10% on the group exam.

### Interactive Group Poster Presentation

**Value:** 10% of final grade

**Date:** Mar. 30 (during lab period)

**Type:** E- poster ppt and oral presentation delivered to class.

**Description:** Completed in groups of 2-3, 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. You should conduct your own independent research on the topic and gather ideas on study designs. You can access the common search databases (eg. Scopus, Web of Science) for research literature using the library resources - see <https://libguides.usask.ca/biology>. Please submit the electronic ppt of your poster by 5pm the day before to allow me to read them. Length: 10-12 minute oral presentation followed by 5 minutes of questions.

## Final Exam

**Value:** 35% of final grade

**Date:** TBD- during final exam period

**Type:** Seated in person 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	Assignment	Scheduled Due Date (by 1:30pm)
2	Lab 1	Jan 19
3	Lab 2	Jan 26
4	Lab 3	Feb 2
5	Lab 4	Feb 9
6	Lab 5	Feb 17 (1 day later)
7	MIDTERM EXAM	Feb 16 (during lab period)
8	Lab 6	Mar 9
9	Tutorial 1 (Assigned questions and journal article summary)	Mar 16
12	Group Poster presentation	Mar 30
	FINAL EXAM	TBA

## Submitting Assignments and Late Penalty

All assignments should be handed in via **CANVAS in PAWS by 1:30pm on the due date**. Late assignments will be accepted with a **10% penalty** per business 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 (including all lecture and lab assignments) of 50% is the minimum passing grade. All lecture material, labs, tutorials, and assigned readings 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. slides/figures) are posted on Canvas; however, due to the nature of the course, slides do not contain all examinable content such as in class examples and should be supplemented by note taking and your readings. 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 a formal opportunity 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 a midterm 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 at the discretion of the instructor. Final exam deferrals are scheduled by the university. 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 (<https://secretariat.usask.ca/documents/student-conduct-appeals/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/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.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/secretariat/student-conduct-appeals/index.php>

## **Access and Equity Services (AES)**

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so.

Students who suspect they may have disabilities should contact AES for advice and referrals. In order to access AES programs and supports, students must follow AES policy and procedures. For more information, check [www.students.usask.ca/aes](http://www.students.usask.ca/aes), or contact AES at 306-966-7273 or [aes@usask.ca](mailto:aes@usask.ca).

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

## **Student Supports**

### **Student Learning Services**

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site <http://library.usask.ca/studentlearning/>.

### **Writing support**

The Writing Centre offers up to 10 hours of free writing support for students as well as workshops and other materials. This is not an editorial service. For more information see <https://library.usask.ca/studentlearning/writing-help/>

### **Student and Enrolment Services Division**

The Student and Enrolment Services Division (SESD) focuses on providing developmental and support services and programs to students and the university community. For more information, see the students' web site <http://students.usask.ca>.

### **Financial Support**

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central (<https://students.usask.ca/student-central.php>).

### **Aboriginal Students Centre**

The Aboriginal Students Centre (ASC) is dedicated to supporting Aboriginal student academic and personal success. The centre offers personal, social, cultural and some academic supports to Métis, First Nations, and Inuit students. The centre is also dedicated to intercultural education, bringing Aboriginal and non-Aboriginal students together to learn from, with and about one another in a respectful, inclusive and safe environment. Students are encouraged to visit the ASC's Facebook page (<https://www.facebook.com/aboriginalstudentscentre/>) to learn more.

### **International Student and Study Abroad Centre**

The International Student and Study Abroad Centre (ISSAC) supports student success in their international education experiences at the U of S and abroad. ISSAC is here to assist all international undergraduate, graduate, exchange and English as a Second Language students and their families in their transition to the U of S and Saskatoon. ISSAC offers advising and support on all matters that affect international students and their families and on all matters related to studying abroad. Please visit [students.usask.ca](http://students.usask.ca) for more information.