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## PBIO\*4530 - Plants and Environmental Pollution

### Winter 2024 Course Outline

Section: 01

Credits: 0.50

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## Land Acknowledgement: Guelph

The University of Guelph resides on the ancestral lands of the Attawandaron people and the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land and offer respect to our Anishinaabe, Haudenosaunee and Métis neighbours. Today, this gathering place is home to many First Nations, Inuit, and Métis peoples and acknowledging them reminds us of our important connection to this land where we work and learn.

## Calendar Description

This course analyzes the environmental pollution effects on physiological and ecological processes of plants, in both managed and unmanaged ecosystems. Pollutants under study include contaminants of air (such as ozone, sulphur dioxide, NO<sub>x</sub>) and soil (such as metals). This course also covers how to use plants to improve air (both indoor and outdoor), water and soil environment. The format includes both lecture and presentation/discussion of current and historical peer-reviewed literature.

**Prerequisite(s):** (1 of BIOL\*2060, BOT\*2100, ENVM\*1200, ENVS\*2040, ENVS\*2330, PBIO\*3110), CHEM\*1040

**Department(s):** School of Environmental Sciences

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## Course Description

This course will use the ecological risk assessment framework to study the responses of plants to environmental contaminants, mainly pollutants found in air, soil and water. The curriculum will cover characterization of exposure and effects, as well as practical application of these concepts. This course will also discuss on how to use plants to improve air, water and soil environment qualities (i.e., phytoremediation).

## Lecture Schedule

TuTh 11:30am-12:50pm in MCKN\*228 (1/8 to 4/23)

## Instructor Information

Youbin Zheng

Email: yzheng@uoguelph.ca

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## Additional Support

The best way to contact Professor Zheng is through email to schedule either a face-to-face meeting or a Zoom meetings as needed.

## Learning Resources

There is no textbook for this course. Some readings will be posted at courselink.

## Course Level Learning Outcomes

At the end of this course, successful students will be able to:

1. Characterize and describe 8-10 common environmental pollutants (e.g., ozone, SO<sub>2</sub>, NO<sub>2</sub>, NO, CO<sub>2</sub>, particulate, acid deposition, heavy metals), including their sources, chemical and physical characteristics, current and historical concentrations, and regional and global distributions.

2. Understand and describe how plants are exposed to, and the uptake paths of, common environmental pollutants in natural and man-made environments.
3. Identify and describe the responses (e.g., visible symptoms, growth and yield) of plants to 8-10 common environmental pollutants.
4. Understand the mechanisms of different plants (e.g., indoor and outdoor plants) in removing or degrading common environmental pollutants, and apply these mechanisms in green infrastructures (e.g., living walls, green roofs and constructed wetlands) for environmental quality improvement.
5. Demonstrate enhanced critical thinking skills through critiquing current scientific literature, evaluating other students' presentations and participating in lectures and in-class discussions.
6. Demonstrate enhanced communication skills through in-class presentations and critiquing fellow students' presentations.
7. Exhibit improved professional and ethical behavior towards diverse scientific ideas and academic opinions through presentations, group discussions and evaluating presentations by other students.

## Schedule of Topics and Assignments

Day:	Date:	Topic	Activities	Due:
Tue	1/9	Introduction		
Thu	1/11	Risk assessment framework. Introduce presentation topics and students start to form teams.		
Tue	1/16	Intro to gaseous pollutants and plants.	Decide which group is going to work on what topic for presentation.	
Thu	1/18	Intro to gaseous pollutants and plants. Ozone & plants		
Tue	1/23	Ozone & plants.		
Thu	1/25	How to write & read scientific paper/report.		
Tue	1/30	NOx & plants.		
Thu	2/1	Prepare your presentation with your partner		
Tue	2/6	SO <sub>2</sub> & plants		
Thu	2/8	SO <sub>2</sub> & plants. Discuss about presentation evaluation again.		
Tue	2/13	Particulate & plants/air pollution combination effects on plants.		
Thu	2/15		Midterm Exam	
Tue	2/20	Winter Break		
Thu	2/22	Winter Break		
Tue	2/27	How to use plants to improve air quality; Green infrastructure (e.g. green roof, living wall) and environmental remediation.	P 1 (20 min each presentation).	
Thu	2/29	Green infrastructure (e.g. green roof, living wall) and environmental remediation.	P2, P3	
Tue	3/5	Intro to metal and plants, including methods for studying plant response to metal pollutants. P4, 5.	P4, P5	
Thu	3/7	Intro to metal and plants, including methods for studying plant response to metal pollutants.	P6, P7	
Tue	3/12	Metal availability, uptake, transportation and accumulation.	P8, P9	
Thu	3/14	Metal availability, uptake, transportation and accumulation.	P10, P11	
Tue	3/19		P12, P13, P14	

Thu	3/21		P15, P16, P17
Tue	3/26		P18, P19, P20
Thu	3/28	Effects of metals on plants.	P21 & 22
Tue	4/2	Environmental remediation	P23 & 24
Thu	4/4	Wrap up	P25

## Final Exam

Date: Apr 20

Time: Sa 8:30am-10:30am

Location: TBA *Please see Web Advisor closer to the date of scheduled final for location.*

To understand rules and regulations regarding Examinations students are encouraged to read Student's Responsibilities (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/examinations/>)

If the student is unable to meet the final exam requirements due to medical, psychological or compassionate circumstances they are encouraged to review Student's Responsibilities in the Academic Consideration, Appeals and Petitions (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/>) section of the Academic Calendar.

## Grading Schemes

Discussion and engagement 10% April 4, 2024

Presentation (group) 30% Due on the presentation date.

Midterm 25% Due on Feb 15, 2024

Final exam 35% Due on April 20, 2024

## Last Day to Drop Course

The final day to drop Winter 2024 courses without academic penalty is the last day of classes: April 08

After this date, a mark will be recorded, whether course work is completed or not (a zero is assigned for missed tests/assignments). This mark will show on the student's transcript and will be calculated into their average.

## Standard Statements for Undergraduate Courses

### Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/>) is outlined in the Undergraduate Calendar.

### Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 10 days in advance, and no later than the first business day in November, March or July as appropriate for the semester. Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. For students at the Guelph campus, information can be found on the SAS website. (<https://www.uoguelph.ca/sas/>)

## Accommodation of Religious Obligations

If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements.

See the Academic calendar for information on regulations and procedures for Academic Accommodations of Religious Obligations (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-accommodation-religious-obligations/>).

## Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all undergraduate students except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in the Undergraduate Calendar - Dropping Courses (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/>).

## Email Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

## Health and Wellbeing

The University of Guelph provides a wide range of health and wellbeing services at the Vaccarino Centre for Student Wellness (<https://wellness.uoguelph.ca/>). If you are concerned about your mental health and not sure where to start, connect with a Student Wellness Navigator (<https://wellness.uoguelph.ca/navigators/>) who can help develop a plan to manage and support your mental health or check out our mental wellbeing resources (<https://wellness.uoguelph.ca/shine-this-year/>). The Student Wellness team are here to help and welcome the opportunity to connect with you.

## Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

## Recording of Materials

Presentations that are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## Resources

The Academic Calendars (<http://www.uoguelph.ca/registrar/calendars/?index>) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

## When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for Academic Consideration. (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/>)