# Biology 4405G – Ecosystem Ecology
# Winter 2017 Course Syllabus

## Course description

This course considers commonalities of terrestrial ecosystems from tropical and temperate rainforests to the high arctic tundra. We will trace the flow of water, energy, and nutrients from their biotic origins to their global cycles through microbes, plants, and animals. We will examine terrestrial ecosystems through space and time using the concepts of disturbance and succession, ecosystem stability, aboveground – belowground linkages, and global change.

## Goals of the Course

Understanding the structure and function of terrestrial ecosystems is fundamental to their conservation and necessary for remediation of impacted environments. Ecosystem ecology is an area of active research nationally and internationally, and perspectives gained from the "ecosystem approach" have proven very valuable to conservation biologists, natural resource management agencies, and governments at all levels. The goals of this course are:

1) *To teach you the basic principles of ecosystem ecology with a focus on terrestrial systems.* This includes principles and theories on the relationships between terrestrial life and abiotic factors in the environment to understand major pathways by which carbon, nitrogen, phosphorus and water cycle, and energy passes through terrestrial ecosystems. We will also draw examples from freshwater and marine systems.
2) *To use a biome concept to recognize and categorize the variety of terrestrial ecosystems on Earth.* We will explore terrestrial habitats from tropical rainforests, grasslands, and boreal forests, to the arctic tundra from the scale of the smallest soil particles to interactions among regions at a global scale.
3) *To enhance your ability to critically summarise and disseminate information pertaining to current issues in ecosystem ecology.* Tutorial assignments will address complex environmental and social issues facing different ecosystem types. You will be expected to find, synthesise and summarise information on a variety of topics, and present this in an informal discussion-type setting. Tutorial assignments will also assist you in learning to find and synthesise information from a variety of sources, and improve your writing in preparation for the final lab report.
4) *To improve your data collection, analysis and writing skills.* Labs will provide the hands-on application of how to measure and analyse ecosystem-level data. This data will be used in a written report in the form of a scientific article. Your ability to write is directly linked to the effort you place on reading scientific articles; the more you read, the more you will understand what is expected of you.

## Prerequisites

The prerequisite for this course is Biology 2483A (Ecology). Unless you have either the prerequisite for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

## Course Timetable

*Lectures:* Section 001 Tuesdays & Thursdays 10:30-11:30am B&GS-1056
*Labs:* Section 002: Fridays 9:30am-12:30pm (*B&GS 3015)
Section 003: Fridays 9:30am-12:30pm (*B&GS 3015)
*Tutorials:* Section 002: Fridays 9:30am-12:30pm (*STVH 1155)
Section 003: Fridays 9:30am-12:30pm (*STVH 1155)

**Office Hours**

Instructor office hours are by appointment. **Please put '4405' at the beginning of the subject for all email correspondence.** We will respond to Western email addresses only. Please note, we cannot guarantee responses to questions in the 24 hour period prior to assignment deadlines and exams.

**Instructor Information**

| | *Position* | *Office* | *Email* |
|---|---|---|---|
| Dr. Zoë Lindo | Assistant Professor | BGS 2034 | zlindo@uwo.ca |
| Ms. Sarah Lee | Lab Technician | BGS 3018 | sarahlee@uwo.ca |
| Rachel Chambers | Teaching Assistant | TBA | rchamb3@uwo.ca |
| Julia Palozzi | Teaching Assistant | TBA | jpalozzi@uwo.ca |

**Course Materials**

1. Website: http://owl.uwo.ca. PDF files of lecture presentations will be posted on the website prior to lectures. These files will be available in PDF format only. The course website will be the primary method of communication with students outside of lecture. All important documents (syllabus, lectures, assigned readings, updates etc.) will be posted to the website. It is your responsibility to check the website frequently.
2. Textbook: *Principles of Terrestrial Ecosystem Ecology*. FS Chapin III, P Matson, H Mooney, Springer-Verlag, New York, 2002 (1st edition available as PDF).
3. Required Readings: will be posted on the course website regularly. Students are expected to complete readings before the corresponding tutorial.
4. Equipment: proper clothing must be worn for all labs (long pants, socks, closed-toed shoes); lab coat and safety glasses are required for all labs.

**Evaluation**

| | | |
|---|---|---|
| Lecture participation | Half sheets (see below) | 5% |
| Lab participation | Attendance (see below) | 5% |
| Tutorial Assignments | Tutorials 1 & 2 for hand-in | 5% |
| Midterm exam I | In-class (Feb. 2) | 10% |
| Midterm exam II | In-class (Mar. 7) | 10% |
| Laboratory report | Due (Tues. April 4th; noon)<br>Paper copy to your TA and e-copy to TurnItIn on OWL | 20% |
| Final exam (cumulative) | To be scheduled by the Registrar's Office | 45% |

**Half-sheets**

Half-sheets are a quiz-style learning tool that I use to demonstrate learner-centred progress. What does that mean!? Thursday mornings will start and end with a one question quiz. There are no marks associated with the answer, but you are expected to hand in half-sheets at the end of class for your 5% participation mark. Half-sheets will be returned for your study purposes if requested.

**Exams**

There will be two in-class term exams and a cumulative final exam in this course; all exams are compulsory. Students are responsible for material presented/discussed in lecture and laboratory, as well as material covered by any assigned

readings. You can expect the exams to include any or all of the following question types: multiple choice, matching, fill-in-the-blank, short answer and/or essay. Non-programmable calculators are permitted for use during the midterm and final exams. No other aids are allowed. **Cellular phones, iPods, and other similar technology are not permitted in the exam room.** Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

**Scholastic offences:** Scholastic offences are taken seriously and students are directed to read the policy at: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

**Plagiarism:** Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt by using quotation marks where appropriate and/or by proper referencing including citations. Please see Dr. Lindo or your TA if you are unsure how to do this.

All required papers will be subject to submission for textual similarity review to the commercial plagiarism detection software (i.e. TurnItIn) under license to the University for the detection of plagiarism. All papers submitted will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com.

**Accommodation for Medical Illness**

**If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office of YOUR Faculty as soon as possible, and notify the instructor immediately.** It is the student's responsibility to make alternative arrangements with the instructor once the accommodation has been approved and the instructor has been informed.

As part of university policy, students that have been granted permission by the Dean's Office to write the make-up examination will write the exam at a time scheduled by the instructor. There will be one written make-up examination given within two weeks of the originally scheduled exam. The format of the make-up exam is at the discretion of the instructor. Arrangements will be made for students that have valid reasons for missing this make-up.

Students who miss an exam and do **not** receive appropriate accommodation from their Dean's Office will be awarded a '0' for the missed examination. There are no exceptions to this policy. Exams and/or assignments will **not** be re-weighted to accommodate poor performance on any assessment in this course, or for unapproved absence during the mid-term or final exam. Additional assignments will not be accepted in lieu of a missed exam, lab, or to account for poor performance on any course component.

Please refer to the University's Policy on Accommodation for Medical Illness and Student Medical Certificate at: https://studentservices.uwo.ca/secure/index.cfm

In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from your Dean's Office immediately. For further information, please see:
http://www.uwo.ca/univsec/handbook/appeals/medical.pdf
Students who are in emotional/mental distress should refer to Mental Health@Western
http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

**Academic Accommodations for Religious Holidays**

Effective September 1, 1997, the Faculty of Science strictly adheres to the University policy on accommodation for students based upon conflicts with religious holidays (see the appropriate section in the current Western Academic Calendar). Accommodation will only be granted for the specified date of the religious holiday. Only holidays appearing on the University-approved list of dates will be accommodated. See the Office of the Dean for the list of approved dates. Students requesting accommodation must do so, in writing, to the Office of the Dean at least a month before the scheduled exams.

**Accessibility**

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x82147 for any specific question regarding an accommodation. **I do not permit the recording or photographing of lectures.**

**Lecture Schedule**

*This is a tentative schedule; the order of lecture presentations may change.*

| Section | Date | Lecture | Topic |
|---|---|---|---|
| Introduction | Jan 5 | 1 | Introduction and course organisation |
| Friday Jan. 6th: No labs | | | |
| Section I: Ecosystems as physical - biological interactions | Jan 10 | 2 | The ecosystem concept and the structure of terrestrial ecosystems; History of Ecosystem Ecology |
| | Jan 12 | 3 | Climate, geology and soils |
| Friday Jan. 13th: Lab 1: Section 003; Tutorial 1: Section 002 | | | |
| | Jan 17 | 4 | Terrestrial biomes: forests |
| | Jan 19 | 5 | Terrestrial biomes: grasslands, savannah, tundra |
| Friday Jan. 20th: Lab 1: Section 002; Tutorial 1: Section 003 | | | |
| | Jan 24 | 6 | Watersheds: structure and dynamics |
| | Jan 26 | 7 | Overview of water and energy flow through major biogeochemical cycles |
| Friday Jan. 27th: Lab 2: Section 003; Tutorial 2: Section 002 | | | |
| Section II: Biotic interactions - Aboveground | Jan 31 | 8 | Productivity: Energy and carbon balance in plants; NPP across terrestrial systems |
| | Feb 2 | | **In-class Exam I** |
| Friday Feb. 3rd: Lab 2: Section 002; Tutorial 2: Section 003 | | | |
| | Feb 7 | 9 | Nutrient use by plants; plant allocation |
| | Feb 9 | 10 | Foodwebs from an energy perspective; herbivory defences, and secondary production |
| Friday Feb. 10th: Lab 3: Section 003; Tutorial 3: Section 002 | | | |
| Section III: Biotic interactions - Belowground | Feb 14 | 11 | Litter-fall & decomposition; development of humus and soil systems |
| | Feb 16 | 12 | Nutrient cycling in soils |
| Friday Feb. 17th: Lab 3: Section 002; Tutorial 3: Section 003 | | | |

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|---|---|---|---|
| **Reading week (Feb. 20th – Feb 24th) No classes, labs or tutorials** | | | |
| | Feb 28 | 13 | Belowground foodwebs; production, heterotrophic regulation of ecosystem function |
| Section IV: Large-scale processes | Mar 2 | 14 | Guest lecture – TBA |
| Friday Mar. 3rd: Lab 4: Section 003; Tutorial 4: Section 002 | | | |
| | Mar 7 | | **In-class Exam II** |
| | Mar 9 | 15 | Spatial heterogeneity |
| Friday Mar 10th: Lab 4: Section 002; Tutorial 4: Section 003 | | | |
| | Mar 14 | 16 | Temporal dynamics: variability, disturbance and succession |
| | Mar 16 | 17 | Biodiversity, ecosystem function, and productivity |
| Friday Mar. 17th: Lab 5*****: Section 003; Tutorial 5*: Section 002 | | | |
| | Mar 21 | 18 | Ecosystem stability |
| | Mar 23 | 19 | Global biogeochemistry |
| Friday Mar. 24th: Lab 5*****: Section 002; Tutorial 5*: Section 003 | | | |
| Section V: Changes in the terrestrial ecosystem | Mar 28 | 20 | Human impacts on global cycles; climate change |
| | Mar 30 | 21 | Ecosystem services: concept and valuation |
| Friday Mar. 31th: All sections – drop-in lab† | | | |
| | Apr 4 | 22 | Conservation at the ecosystem level; managing and sustaining |
| | Apr 6 | 23 | In class review session for final |

**Laboratories and Tutorials**

Laboratory and tutorial sessions run concurrently. You will alternate weeks between lab and tutorial. Attendance in both is mandatory. **Be sure to go to the correct location each week as outlined by your lab section and the course schedule.** Tutorials are in STVH 1155*. Labs are in BGS-3015*. It is important that you attend the lab section you are enrolled in as lab material will only be available for you at that time.

*The last two formal weeks of labs/tutorials (Fri Mar 17, 24) will take place together in a computer lab (HSB 13).

**Lab report:** The final lab report is a compulsory component of the course. As a designated essay course, you must pass the lab report to pass the course. Late lab reports will be penalized 10% per day or part thereof (including weekends), and will not be accepted more than 4 days late. Missed lab or tutorial attendance will not be re-weighted to other course components or lab periods.

†Drop-in lab on March 31 will take place in the regular lab location (BGS 3015)

**Laboratory Schedule:**

- Friday, Jan 13th/20th: Lab 1: Introduction to soils – start soil cube dissection
- Friday, Jan 27nd/ Feb 3rd: Lab 2: Soil physical properties (texture, moisture and organic content)
- Friday, Feb 10th/17th: Lab 3: Soil biotic properties (roots, bacteria, fungi, fauna)
- Friday, Mar 3rd/Mar 10th: Lab 4: Soil chemical properties (pH, ammonium, nitrate, phosphate)
- Friday, Mar 17th/24th: Lab 5: Analyzing data and report preparation (in computer lab HSB 13)
- Friday Mar 31st: All sections drop-in lab (in BGS 3015)

**Lab manual and any assigned tutorial readings will be provided on OWL.**