



UNIVERSITY OF CALGARY  
FACULTY OF SCIENCE  
DEPARTMENT OF BIOLOGICAL SCIENCES  
COURSE OUTLINE

**1. Course: ECOLOGY 419 – TERRESTRIAL COMMUNITIES AND ECOSYSTEMS**

Lecture Sections: L01            MWF                          13:00-13:50                          ST 139    WINTER 2018

Labs    T    09:00; 12:00; 15:00                  BI 236  
    W    09:00; 14:00                          BI 236

Course Coordinator: Dr. Dunfield

Instructors:                  Dr. P. Dunfield                          BI 319D                          220-2469                          pfdunfie@ucalgary.ca  
    Dr. D. Layzell                          BI 578                          220-5161                          dlayzell@ucalgary.ca

Lab supervisor:                  Ms. Louise Hahn                          BI 264                          220-5280                          lhahn@ucalgary.ca

D2L: [ECOL419L01 - ECOL 419 L01 \(Winter 2018\) - Terrestrial Comm & Ecosystem](#)

Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

- 2. PREREQUISITE(S):** Biology 313 and one of Biology 315 or Environmental Science 401  
See section 3.5.C in the Faculty of Science section of the online Calendar  
(<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

- 3. Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

<b>First Midterm Examination</b>	(Feb 5)	<b>17.5%</b>	<b>In-Class</b>
<b>Second Midterm Examination</b>	(Mar 14)	<b>17.5%</b>	<b>In-Class</b>
<b>Laboratory Assignments</b>		<b>30%</b>	
<b>Final Examination</b>		<b>35%</b>	

(There will be a final exam scheduled by the Registrar’s office.)

Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Min. Percent Required	95	88	83	78	74	70	66	62	58	54	50

Each piece of work (laboratory assignments, midterm test or final examination) submitted by the student will be assigned a percentage score. The student’s average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

- 4. Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize himself/herself with these regulations. See also Section E.3 of the University Calendar
- 5. Scheduled out-of-class activities:** Dates and times of approved class activities held outside of class hours. NIL

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

- 6. Course Materials:** TEXT: Recommended: Principles of Terrestrial Ecosystem Ecology, Chapin III FS, Matson PA & Vitousek, PM., Springer-Verlag, New York., Latest Edition. **eBOOK access available via the U of C Library website**

7. **Examination Policy:** No electronic devices may be used during exams. Students should also read the Calendar, Section G, on Examinations.
8. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also Section E.2 of the University Calendar.
9. **ETHICS IN THE BIOLOGICAL SCIENCES**

Studies in the Biological Sciences involve the use of living and dead organisms. Students taking laboratory- and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

**10. OTHER IMPORTANT INFORMATION FOR STUDENTS:**

- (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties.
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities\\_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf).  
  
Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email [addy@ucalgary.ca](mailto:addy@ucalgary.ca) or phone 403 220-3140.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca)  
SU Faculty Rep. Phone: 403 220-3913 Email: [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca);  
Student Ombuds Office: 403 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca); <http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

Department Approval \_\_\_\_\_ ORIGINAL SIGNED \_\_\_\_\_ Date \_\_\_\_\_

## Ecology 419 Course Goals and Tentative Outline

**Ecosystem definition** <http://www.merriam-webster.com/dictionary/ecosystem>

Complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space. An ecosystem's abiotic (nonbiological) constituents include minerals, climate, soil, water, sunlight, and all other nonliving elements; its biotic constituents consist of all its living members. Two major forces link these constituents: the flow of energy and the cycling of nutrients. The fundamental source of energy in almost all ecosystems is radiant energy from the sun; energy and organic matter are passed along an ecosystem's food chain. The study of ecosystems became increasingly sophisticated in the later 20th century; it is now instrumental in assessing and controlling the environmental effects of agricultural development and industrialization.

Terrestrial ecosystems provide a home for much of the world's biodiversity, supply humans with most of the food and fibre they demand, and are increasingly looked upon to play a major role in efforts to manage greenhouse gas emissions and mitigate climate change. Ecology 419 will explore the biological principles that underpin these three major roles for terrestrial ecosystems with a focus on the forces, pathways and technologies controlling the flows of energy, carbon (C) and nitrogen (N) through terrestrial ecosystems. By the end of this course, engaged students will be able to:

- Quantitatively **compare** the annual flows of energy and carbon through biological systems with the energy and carbon flows that provide humans with fuels and electricity
- **Describe** the opportunities for using biological systems to mitigate climate change by reducing CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions and by enhancing carbon sinks
- **Describe** the drivers of primary productivity and the potential for positive feedbacks among them
- **Predict** key characteristics of plant and microbial communities based on environmental factors such as temperature, rainfall, and nutrient availability
- **Describe** the biotic and abiotic processes that control nutrient and carbon cycling through soil, water, air, and biomass
- **Describe** the current knowledge of climate change impacts on terrestrial systems, and suggest strategies to mitigate or minimize these impacts
- **Describe** the policy instruments that could be deployed to facilitate the use of biological systems in the mitigation of climate change in Canada and globally
- **Employ** common techniques for **quantifying** various physical characteristics (e.g. moisture, texture, composition), chemical characteristics (e.g. organic carbon and organic matter content, micro- and macronutrients, pH), biological characteristics (e.g. bacteria, fungi, invertebrates), and ecosystem processes (e.g. nitrifying potential, soil respiration) in soils
- **Develop** a unique hypothesis to **test** predictions of soil responses to disturbance, using data analysis and literature review, and present the results as a scientific conference-style poster.

## Ecology 419 – Tentative Course outline W18

Jan 8	1 L	Dunfield/Layzell	Course outline and expectations / Introduction to terrestrial ecosystems and global climate change
Jan 10 - 15	3 L	Layzell	Energy systems and the global carbon cycle
Jan 17 - 22	3 L	Layzell	Photosynthesis / Effects of elevated CO <sub>2</sub> on ecosystems
Jan 24- 29	3 L	Layzell	Roots and the cost of N assimilation / N fixation
Jan 31-Feb 2	2 L	Layzell	Biological solutions to climate change
<b>Feb 5</b>		<b>Layzell</b>	<b>Midterm 1 In-Class</b>
Feb 7 - 9	2 L	Dunfield	The flow of C through ecosystems / Trophic interactions / Decomposition
Feb 12 - 16	3 L	Dunfield	Soils
<b>Feb 19 - 23</b>	-		<b>Reading Week, no classes</b>
Feb 26 -Mar 2	3 L	Dunfield	Plant-Soil-Microbe interactions
Mar 5 - 7	2 L	Dunfield	The nitrogen cycle / Mitigating N <sub>2</sub> O emissions
Mar 9 - 12	2 L	Dunfield	The methane cycle / Mitigating methane emissions
<b>March 14</b>		<b>Dunfield</b>	<b>Midterm 2 In-Class</b>
Mar 16 - 19	2 L	Dunfield	Terrestrial ecosystem types / Biogeography
March 21 - 28	3 L	Layzell	Anthropogenic ecosystems and their energy flows: Agriculture, forestry, urban systems
<b>March 30</b>			<b>Good Friday, no classes</b>
April 2-4	2 L	Layzell	Enabling biological solutions to climate change: policy instruments, opportunities and challenges
April 6-11	3 L	Dunfield	Biodiversity and ecosystem functioning / Predicted impacts of climate change on biodiversity
April 13	1 L	Dunfield/Layzell	Review, Q and A

## Ecology 419 – Tentative Laboratory Schedule W18

Week 1 (Jan 9, 10)	Introduction to communities and ecosystems, soils, and scientific writing
Week 2 (Jan 16, 17)	Soil texture, moisture and organic content
Week 3 (Jan 23, 24)	Root and plant biomass, soil bacteria and fungi
Week 4 (Jan 30, 31)	Soil and forest invertebrates
Week 5 (Feb 6, 7)	Soil and forest invertebrates
Week 6 (Feb 13, 14)	Soil nutrients and ions
<b>Week 7 (Feb 20, 21)</b>	<b>READING WEEK: NO LABS</b>
Week 8 (Feb. 27, 28)	Data Analysis, soil nitrifying potential (set-up)
Week 9 (Mar 6, 7)	Soil respiration (set-up)
Week 10 (Mar 13, 14)	Soil respiration (finish) and nitrifying potential (finish)
Week 11 (Mar 20, 21)	Poster presentation workshop
Week 12 (Mar 27, 28)	Open lab: poster assembly
Week 13 (Apr 3, 4)	Term project due, project presentations

**Participation: Value = 3%** Students are expected to be prepared for labs, and to participate fully in all labs. This means having read the lab manual before coming to lab, being on time, being able to answer pre-lab questions, completing pre-lab assignments, and attending all labs. Labs that are missed for invalid reasons will result in lost participation marks.