

**University of Guelph  
College of Biological Science  
Department of Integrative Biology**

**COURSE OUTLINE**

**Discovering Biodiversity (BIOL\*1070)  
Winter 2016**

**Course Description**

BIOL\*1070 – Discovering Biodiversity strongly emphasizes learning and reasoning skills, biological inquiry, and key concepts in evolution, ecology, and organismal biology. Topics discussed in the course include: the meaning and significance of biodiversity, current issues surrounding biodiversity, the evolutionary processes through which biological diversity originates and is interrelated, the complexity of organisms, the importance of physical organization and regulatory processes, the nature of interactions among organisms, and the nature of interactions between organisms and their biotic and abiotic environments. This course complements the two other first-year biology courses, BIOL\*1080 and BIOL\*1090. Prerequisites: none.

**Credit Weight**

0.5 Credits

**Class Schedule and Location**

Lecture Section 01: Monday/Wednesday, 9:30-10:20, ROZH 101

Lecture Section 02: Monday/Wednesday, 11:30-12:20, ROZH 104

Seminars: Monday-Thursday, 10:00-3:30; see WebAdvisor for your specific seminar section.

**Teaching Team**

Instructor: Dr. Shoshanah Jacobs

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Instructor: Dr. Steven Newmaster

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Course Coordinator: Dr. Aron Fazekas

Course Email: biol1070@uoguelph.ca

Office location: SSC 3510, office hours: drop in or by appointment.

## **Course Content**

The course will focus primarily on **skills** development and the process of inquiry entrenched within the meaning, significance, and current issues surrounding biodiversity. These will be underpinned by core **concepts** in evolution, ecology and physiology that will be introduced and reinforced throughout the course:

### **Skills:**

1. To develop capabilities for independent study and research.
2. To develop the ability to assess and analyze biological information.
3. To reinforce numeracy skills by developing a broader knowledge base of data spreadsheets, statistical analyses and data presentation.
4. To understand and practice the process of biological inquiry using scientific methods and reasoning.
5. To develop skills for working in groups cooperatively and efficiently.
6. To develop effective communication skills.

\*Students will be required to participate in discussion groups in class and seminars. Some assignments will be based on group work, however the majority of marks in the course are based on individual work.

### **Concepts:**

#### Evolution:

1. The processes by which biodiversity originates and is interrelated (evolution, with emphasis on natural selection and “tree thinking”).
2. Variability occurs at multiple levels: variation (population) vs. diversity (species) and may be visible (phenotypic) or not necessarily visible (genetic).
3. Causes and consequences of variation at population & species level.
4. The factors determining, relatedness and phylogeny, genetic isolation.
5. Adaptation and the pros/cons of specialization, invasions and radiations.
6. Consequences for competition (short-term, among conspecifics or between species), speciation (long-term), and extinction risk (long-term).

#### Ecology:

1. The nature of interactions among organisms and between organisms and their biotic and abiotic environments at the ecological scale.
2. Variability is expressed at different levels of organization (ecosystems, populations/species, and individuals).
3. Causes of diversity at each level can be understood by studying the processes operating in the levels below; the consequences of diversity can be examined as they affect diversity in the levels above.
4. Ecosystem diversity is known to vary both in space and time. Historical processes affect the dynamics of species diversity.
5. Understanding the complexity of variables associated with the causes and consequences of diversity.
6. Uncertainty in current dogma and the putative effects of anthropogenic change.

### Physiology:

1. The complexity of organisms and the importance of physical organization and regulatory processes (e.g., information flow, structure/function, development).
2. Changes in the external environment impacts organisms. Organisms i) exchange molecules with the external environment, ii) regulate internal environment (homeostasis) through feedback mechanisms, iii) regulate, others conform to specific environmental parameters.
3. Organisms are organized in a hierarchy from cells to tissues to organs to organ systems. Structural features at all levels of organization have functional significance.
4. Plants respond to environment changes; circadian rhythms, dormancy, temperature stress.
5. Animals respond to temperature changes differently depending on their thermal group (endothermy, ectothermy): methods of heat transfer; metabolic rate changes with animal size, activity, temperature; strategies to cope with extreme cold in ectotherms and endotherms; time frame of responses (acute, chronic, evolutionary time).
6. Impacts of climate change in arctic organisms include factors such as physiological change, geographic range and ecosystem disruption.

### **Specific Learning Outcomes:**

1. Explain the central concepts of biodiversity, methods of analysis, and its ecological and societal importance.
2. Develop accurate conceptions of evolutionary processes and patterns (especially natural selection and “tree thinking”), and to correct common misconceptions about evolution.
3. Construct a conceptual framework that explains some of the causes and consequences of forest diversity.
4. Describe the interactions between organisms and their biotic and abiotic environments and be able to apply these concepts to real-world examples.
5. Organize and analyze data that characterize biological variation, patterns and relationships.
6. Interpret complex graphs and figures and be able to choose appropriate graphs and figures to illustrate different types of data.
7. Practice the process of biological inquiry using scientific methods and reasoning using real examples.
8. Appreciate the integrative nature of modern biological science.
9. Develop a level of comfort with the complexity and uncertainty inherent in biological science.

### **Lecture Content:**

Two 50-minute in-class interactions per week (with two Professors). The in-class interactions will focus on inquiry cases that explore both skills and major concepts. The first case study, “Invasion! Mussels of the Great Lakes Regions” is based on a serious and current concern about loss of biodiversity in mussel species in the Great Lakes and watersheds. Key concepts in evolution will be discussed in the context of an urgent biological, environmental and societal issue in Ontario. The second inquiry case, “Forest Biodiversity” is based on controversial issues surrounding species diversity in forests and conservation biology. Key concepts in evolution and ecology will be discussed within the framework of current ideas about forests. The third inquiry case “An Arctic Ecosystem 8° C Warmer” concerns climate change and the impact on arctic organisms. Key concepts in evolution, ecology and physiology will be integrated into a

discussion of the impact of temperature change in the short and long-term on individuals, populations and the ecosystem. In-class interactions will involve active learning approaches (e.g. small and large group discussions, use of electronic clickers) and mini-lectures.

### Seminars:

One 50-minute seminar per week (~30 students + Teaching Assistant). Seminars will emphasize skills development (especially modes of scientific inquiry) and small group interactions. Students will meet weekly with a graduate student Teaching Assistant and the same group of ~30 students. Students will be organized into groups of ~4 students for activities and discussions (see below). Seminars take place both in the Science Complex and outdoors in the Dairy Bush, a woodlot on campus. Students must dress appropriately for the weather during the outdoor seminars.

### Course Assignments and Tests

| Form of Assessment   | Weight of Assessment (% of final) | Due Date of Assessment                 | Course Concepts                                       | Learning Outcomes Addressed |
|--|-----------------------------------|--|---|-----------------------------|
| Midterm Exam 1 (Multiple Choice)                           | 10%                               | Feb 1 <sup>st</sup><br>5:30 – 6:45pm   | Inquiry Case 1 – Evolution                            | 1, 2                        |
| Midterm Exam 2 (Multiple Choice)                           | 15%                               | March 7 <sup>th</sup><br>5:30 – 6:45pm | Inquiry Case 2 – Ecology                              | 1, 3, 4, 6                  |
| Assignment 1 (lowest mark of Assignment 1 to 5 dropped)    | 3%                                | Jan 25-28                              | Identifying Organisms                                 | 3                           |
| Assignment 2   | 3%                                | Feb 1-4                                | Hypotheses/Predictions                                | 7                           |
| Assignment 3   | 3%                                | Feb 8-11                               | Biological Variation                                  | 1, 2, 5                     |
| Assignment 4   | 3%                                | Feb 22-25                              | Methods – sampling data                               | 3, 4, 5, 6, 9               |
| Assignment 5   | 3%                                | Feb 29-Mar 3                           | Sampling plants - Dairy Bush                          | 3, 4, 5, 7, 9               |
| Quizzes (11 quizzes at 0.5% with lowest quiz mark dropped) | 5%                                | Weekly (on-line)                       | Evolution, ecology & physiology                       | 1-9                         |
| Sci. Inquiry Workshop                                      | 1%                                | Jan 25-31                              | Scientific Inquiry                                    | 1, 5, 6, 7, 8, 9            |
| Numeracy Workshop  | 1%                                | Feb 1-7                                | Numeracy  | 1, 5, 6, 7, 8, 9            |
| Forest Fragments Assignment                                | 11%                               | Mar 14-17                              | Ecology, Numeracy                                     | 1, 3, 4, 7, 8, 9            |
| Interdisciplinary Project                                  | 10%                               | April 4-7                              | Integrative thinking: Evolution, ecology & physiology | 1, 6, 8, 9                  |

**Final examination date and time: Friday, April 15<sup>th</sup>, at 2:30 pm.**

**Final exam weighting:** 35%. Undergraduate examination regulations can be found at:

[Undergraduate Calendar - Examinations](#)

**Up to 5% bonus marks:** Throughout the lectures we will have 'clicker questions'. All of these will be worth up to a 5% bonus on your final grade. We will indicate the value of each one when they are presented, some questions will be marked simply for clicking in an answer, and others will be worth more if you select the correct answer. Stay tuned during lectures for more information and make sure to REGISTER YOUR CLICKERS at:

<http://www.uoguelph.ca/courselink/iclickers.html>.

We will begin counting clickers for marks on the first day of class so please come prepared and registered.

## **Course Resources**

### **Required Texts**

(available in the University of Guelph bookstore):

Newmaster *et al.* 2013. *Woodlot Biodiversity* 2<sup>nd</sup> Edition

ISBN 978-09866554-1-8 (must use the 2<sup>nd</sup> edition).

Metcalf-Smith *et al.* 2005. *Field Guide to the Freshwater Mussels of Ontario*.

ISBN 0-9733179-2-2.

### **Seminar Manual:**

The required seminar manual will be available for sale from the Department of Integrative Biology (times and locations for purchase will be announced in class and posted on the course homepage).

### **Other Resources:**

This course makes extensive use of CourseLink, the University of Guelph's online learning environment. The course website will provide information and updates about the course, including background information on the inquiry cases, schedules, quizzes, discussions, and tracking of your progress.

iclickers are required. See above for further details. These can be purchased at the bookstore.

### **Field Trips**

Some seminars will take place outdoors in the Dairy Bush, a woodlot on campus that is an approximately an 8 minute walk from the Science Complex. Students must dress appropriately for the weather during the outdoor seminars. Students must review the field safety protocols outlined in the seminar manual before engaging in field activities.

## Course Policies

### **Grading Policies:**

#### Inquiry Case Exam #1, #2

**Midterm exams will be held outside of normal lecture hours.** These 40-50 minute exams will consist of multiple choice questions that focus on concepts and skills related to the first two inquiry cases. Sample questions will be discussed in class. There are no make up or alternate exam times offered.

#### Assignments

Students will explore the process of biological inquiry through directed seminar activities and through a field project focused on sampling Forest Biodiversity in a protected forest on campus. In seminars, students will use various methods to identify organisms, discuss concepts and approaches to testing hypotheses, measure biological samples, collect and analyse data. Students will use ecological methods to collect data in the field, use online resources to analyze data, and write an independent report of their findings. Assignments 1, 2, 3, 4, and 5 will be worksheets completed by groups in seminar. Students that are absent, or arrive late to seminar such that they are unable to contribute equally to the group, will be given a mark of zero.

At the end of the term we will drop your lowest seminar assignment mark from Assignments 1 to 5 and not include it in your final grade.

The Forest Fragments Assignment is **completed and submitted individually** by students. This Assignment will be due at the indicated time to the online dropbox, and will be assessed a 25% penalty for each day late or portion thereof.

#### On-line quizzes

Students will be introduced to inquiry cases and related information online. Students will test their knowledge and understanding of the key concepts and terminology in weekly online quizzes. Quizzes that are submitted late will be given a mark of zero.

#### Interdisciplinary Project

Students will change seminar groups for the last 3 weeks of the semester and interact with students in BIOL\*1080 and BIOL\*1090. Students will work in small teams of students to explore an interdisciplinary theme from different perspectives depending on their course affiliation. Students will individually contribute a portion of a final poster presentation, as well as contribute to a group written component. Late Interdisciplinary Projects will **not** be accepted for grading and must be presented in the assigned seminar times.

#### Final Exam

The final exam will be held outside of class during the normal final exam period. This 2 hour exam will consist of multiple choice questions that focus on the 3rd inquiry case inquiry as well as application of concepts from the entire semester to novel biological examples. Sample questions will be discussed in class.

**Course Policy on Group Work:**

Assignments 1, 2, 3, 4, and 5 will be worksheets completed and submitted by **groups** in seminar.

The Forest Fragments Assignment is completed and submitted **individually** by students.

**Course Policy regarding use of electronic devices and recording of lectures:**

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

**University Policies****E-mail Communication:**

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

**Academic Consideration:**

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration: [Undergraduate Calendar - Academic Consideration](#)

**Academic Misconduct:**

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 is detailed in the Undergraduate Calendar: [Undergraduate Calendar - Academic Misconduct](#)

**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.

**Accessibility:**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: [Centre for Student with Disabilities](#)

**Course Evaluation Information:**

CCS now provides the U of G Online Course Evaluation System in a secure, online environment. End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions form part of the information used by Promotion and Tenure Committees in evaluating the faculty member's contributions in the area of teaching. Course evaluations are now conducted through this web site. Login with your email account login ID and password. [Course Evaluation](#)

Occasionally course evaluations are conducted in class.

**Please Note:**

Instructors do **NOT** receive evaluations until the end of exam period. Furthermore, evaluations are anonymous, unless you specifically indicate you want to acknowledge your comments

**Drop date:**

The last date to drop one-semester courses, without academic penalty, is Friday March 11, 2015. For regulations and procedures for Dropping Courses, see the Academic Calendar: [Undergraduate Calendar - Dropping Courses](#)

**Recording of Materials:**

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

**Resources:**

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: [Academic Calendars](#)