1. Course syllabus

Course description

The goal of this course is to understand how plants have evolved life history strategies and adapted organs to maximize survival, growth, and reproduction as sedentary organisms and to face various limiting environmental conditions such as nutrient shortage, hot deserts, inundation, winters, or arctic and alpine environments. Also, students will learn how trees manage to hold two world records, those of being the oldest and largest living organisms on earth. Lastly, case studies will showcase the fact that behavior, a term historically reserved for animals, also applies to plants; plants can sense the identity of their neighbors (above and below ground), plants have elaborate interactions within and across species and even are engaged in prolonged offspring care. While students will develop a detailed understanding of vascular plant anatomy, including their organs, tissue types, and cells, the study of plant anatomy will always be used as a vehicle to appreciate the amazing range of evolutionary adaptations in vascular plants.

Students will study plant adaptations in four labs, investigating the diversity and function of flowers, leaves, and roots, and experience how plants disperse their seeds on an outdoor hike (rain or shine). In the labs that form an important and mandatory part of the course, (1) students will be required to closely observe and draw plant adaptations in a lab journal; (2) to contribute to a class data set investigating the reproductive strategies of one particular plant species which will form the basis of a written assignment, and (3) hand in quizzes worth part of the final grade covering lab specimens. Because the course heavily relies on course material covered in BIOA01/2H, students will be expected to brush up on selected topics before particular lectures in preparatory quizzes, worth a portion of the final grade.

Learning outcomes

1. Understand the effect of different limiting environmental conditions and how plants cope with them.
2. Understand how plants have evolved the staggering range of present global plant morphologies using the relatively simple modular construction of their bodies into roots, shoots, and leaves.
3. Understand how plants as sessile organisms are manipulating their biotic and abiotic environment for their own interests.
4. Appreciate that all plants are products of natural selection and that interpretation of plant anatomy can only make sense in light of evolution.
5. Relate the structure of particular types of cells, tissues, and organs to their functions in particular environments.

Instructor

Ivana Stehlik
Phone: 416-287-7422
Email: ivana.stehlik@utoronto.ca
Office hours: Thu, 2.10-3.45 PM and by appointment; SW563C

Marks breakdown

Paper on reproductive strategy data set	18%
Writing of practice questions	9%
Taking all class-written practice questions	3%

4 prep quizzes, worth 1.5% each	6%
3 lab quiz worth 1% each	3%
2 each-one-teach-ones	4%
Midterm	24%
Cumulative final exam	33%

Times and location

Course lecture time and place: Tue & Thu 3-4 PM

Lab time and place: Wed, 11 – 2, SW323

Note I: Alternate weeks for the two lab groups (group 1 & 2), if more than 24 students are enrolled

Note II: Stay in your allocated lab group, as lab space is limited. If you have a conflict, talk to Ivana Stehlik

Attendance policy in labs and quizzes

Each lab will contain a quiz which will be handed out at the end of the lab. Unless you attend the lab, you will not be able to submit the quiz (worth 2% each). Only students who contribute to putting together the class data set forming the basis for the reproductive strategy paper will be allowed to write the paper.

If you miss any of these events due to illness or other causes beyond your control, submit, within one week of the missed event, a written request for special consideration to the instructor explaining the reason for missing the event, and attaching appropriate documentation, such as the official University of Toronto medical certificate (www.utoronto.ca/health/form/medcert.pdf).

Penalty for late submission

There will be a penalty of 5% per day for assignments received late. Weekend days count as individual days. Unless there are extenuating circumstances (e.g. medical reasons with an official University of Toronto medical certificate), a mark of zero will be applied to assignments submitted one week late or more. Heavy workloads or malfunctioning computer equipment are not legitimate reasons for late submission. If you know ahead of time that you have a legitimate reason why you cannot hand in an assignment, let the course instructor know two weeks before the due date.

Date	Activity
Sep. 3/5	Lectures 1/2: Course introduction; Pollination I
Sep. 4	Lab 1, group 1: Reproductive strategy lab
Sep. 9	**Preparatory quiz 1 on flower morphology on course website on Quercus**
Sep. 9	**Submit practice question lec 1 to google doc file**
Sep. 10/12	Lectures 3/4: Pollination II
Sep. 11	Lab 1, group 2: Reproductive strategy lab
Sep. 11	**Submit practice question lec 2 to google doc file**
Sep. 16	**Submit practice question lec 3 to google doc file**
Sep. 17/19	Lectures 5/6: Seed dispersal syndromes
Sep. 18	Lab 2: Seed dispersal hike outdoors (rain or shine: come prepared); groups 1 & 2
Sep. 18	**Submit practice question lec 4 to google doc file**
Sep. 23	**Preparatory quiz 2 on root morphology on course website on Quercus**
Sep. 23	**Submit practice question lec 5 to google doc file**
Sep. 24/26	Lectures 7/8: Survival under low-nutrient conditions: mycorrhiza and rhizobium
Sep. 25	Lab 3 group 1: Root lab (rain or shine: come prepared)
Sep. 25	**Submit practice question lec 6 to google doc file**
Sep. 29	**Submission of paper on plant reproduction**
Sep. 30	**Preparatory quiz 3 on nutrient uptake in roots on course website on Quercus**
Sep. 30	**Submit practice question lec 7 to google doc file**
Oct 1/3	Lectures 9/10: Survival under low-nutrient conditions: cluster roots, carnivory, parasitism
Oct. 2	Lab 3, group 2: Root lab (rain or shine: come prepared)
Oct. 2	**Submit practice question lec 8 to google doc file**
Oct. 7	**Submit practice question lec 9 to google doc file**
Oct. 8/10	Lectures 11/12: Survival under dry conditions I
Oct. 9	**Submit practice question lec 10 to google doc file**
Oct. 14	**Submit practice question lec 11 to google doc file**
Oct. 16	**Submit practice question lec 12 to google doc file**
Oct. 21	**Preparatory quiz 4 on C3, C4 and CAM photosynthesis on course website on Quercus**
Oct. 22/24	Lectures 13/14: Survival under dry conditions II
Oct. 28	**Submit practice question lec 13 to google doc file**
Oct. 29/31	Lectures 15/16: Surviving an overabundance of water
Oct. 30	**Submit practice question lec 14 to google doc file**
Nov. 4	**Submit practice question lec 15 to google doc file**
Nov. 5/7	Lectures 17/18: Survival in the winter
Nov. 6	Lab 4, group 1: Leaf lab
Nov. 6	**Submit practice question lec 16 to google doc file**
Nov. 11	**Submit practice question lec 17 to google doc file**
Nov. 12/14	Lectures 19/20: Arctic/alpine survival
Nov. 13	**Submit practice question lec 18 to google doc file**
Nov. 13	Lab 4, group 2: Leaf lab
Nov. 18	**Submit practice question lec 19 to google doc file**
Nov. 19/21	Lectures 21/22: Trees / Plant behavior I
Nov. 20	**Submit practice question lec 20 to google doc file**
Nov. 25	**Submit practice question lec 21 to google doc file**
Nov. 26/28	Lectures 23/24: Plant behavior II
Nov. 27	**Submit practice question lec 22 to google doc file**
Dec. 2	**Submit practice question lec 23 and 24 to google doc file**
Dec. TBA (exam period)	**Final exam (cumulative; lectures 1-24)**

Missed term work policy

What do I do if I miss a term test due to an illness?

If you miss a term test you must provide the UTSC Verification of Illness Form within 2 days of the term test to Jennifer Campbell (jacampbell@utsc.utoronto.ca) Course Coordinator in Biological Sciences, CC-ing Ivana Stehlik (ivana.stehlik@utoronto.ca). Please ensure your physician has indicated a clear start date, end date and visit date(s) on the form. Notes that are missing dates or have dates that do not correspond to the test missed will not accepted.

What do I do if I am going to miss term work that is not due to an illness?

Examples of possible documentation that can be submitted to Jennifer Campbell, CC-ing Ivana Stehlik (note your documentation must indicate the event will occur on the date of the assignment):

A death certificate or funeral notice
A police accident report
Travel ticket or flight itinerary for non-vacation or personal matters
A letter from a Coach or Varsity Administration for UofT Varsity activities
Record of a visit to an emergency room
E-mail sent directly to the Course Coordinator from a Disability Consultant at AccessAbility Service
Samples of reasons that are NOT acceptable include personal travel (vacations), medical prescriptions, weddings, work commitments

What do I do if I miss term work (assignments) due to an illness?

Rather than submitting a Verification of Student Illness form in your request for accommodation you can submit a Self-Declaration of Student Illness form, indicating the days in which you were ill. This form is meant to take the place of the more typical medical form.

Please note the following aspects related to this Self-Declaration of Student Illness form:
1. Similar to the submission of a medical form, YOU ARE RESPONSIBLE for contacting Jennifer Campbell, the administrative staff in your department to make arrangements for an accommodation for this work.
2. You may use the Self-Declaration of Student Illness form ONLY for term assignments. For any term exams in this course, you will need to submit a Verification of Student Illness form. For the final exam, you will need to follow the typical procedures for petitioning to write a deferred exam.
3. You may use the Self-Declaration of Student Illness form up to five times in a course. If you require an additional accommodation for a term assignment, you must then use the standard UTSC Verification of Illness Form.
4. Submitting a false Self-Declaration of Student Illness form constitutes academic misconduct, and could be subject to sanctions under the Code of Behaviour on Academic Matters.

Please submit any Self-Declaration of Student Illness forms in the same fashion as you would have a previous Verification of Student Illness form. Accordingly, you will need to submit this form to Jennifer Campbell, Course Coordinator within three days of the missed term work.

What do I do if I miss a final exam?

Please review the Registrar's website for policies and procedures:
http://www.utsc.utoronto.ca/registrar/missing-examination

Academic integrity policy

According to Section B of the University of Toronto's *Code of Behaviour on Academic Matters*, it is an offence for students to:

• use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.

• include false, misleading or concocted citations in their work.

• obtain unauthorized assistance on any assignment.

• provide unauthorized assistance to another student. This includes showing another student completed work.

• submit their own work for credit in more than one course without the permission of the instructor

• falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.

• use or possess an unauthorized aid in any test or exam.

Violation of the Code of Behaviour on Academic Matters will force the instructor to provide a written report of the matter to the Chair/DeanProvost's and a penalty according to the U of T's guidelines on sanctions will be put into place.

Submission of reports to Turnitin

Students will be asked to submit their papers to turnitin as implemented on Quercus for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site:
(http://www.utoronto.ca/ota/turnitin/ConditionsofUse.html)
Turnitin.com is most effective when it is used by all students; however, if and when students object to its use on principle, the course offers a reasonable offline alternative. The student will then be asked to meet with the course instructor to outline and discuss the report before its final submission to demonstrate the process of creating the report according to the academic integrity policy.

Communication policy

Students are required to regularly and often check their university email to receive announcements relating to the course. To inquire about course-related issues, students are strongly encouraged to solely use their university email, as hotmail or other email providers are spam-filtered on a regular basis. It is the responsibility of the student to make sure his or her email reaches the instructor.

The instructor will not answer any questions related to material discussed in class or during the labs by email (unless it is a clear yes-no answer), but the student is encouraged to ask these questions during official office hours or to schedule a meeting outside office hours by email.

Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach the course instructor and/or the AccessAbility Services Office as soon as possible. Enquiries are confidential.

The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

Readings

There is no required reading and no course book, because no single book covers adequately all course topics. The course heavily relies on sources from the primary literature. In case of conceptual problems, students are encouraged to do their own online research, consult the primary sources referred to on the slides or get help from the instructor before or after class or during office hours.

2. Lab Project

1. Methodology

1.1. General rule

Follow the detailed instructions communicated to you during the lab by the instructor.

1.2. Specific lab instructions and data submission to TA

(1) Using a ruler, measure in mm the largest length (fused corolla) of a given flower. Keep track of this information in your lab journal.
(2) Identify whether a measured flower is a female (code: 1; for a unisexual flower) or a hermaphrodite (code: 2; for a bisexual flower) and keep track of this information along with the flower measurement.
(3) Repeat for all your allocated flowers.
(4) Enter your data into an exl table using the exact table layout as below (Table 1).
(5) Submit your correctly formatted data table to the TA by the end of the day of your lab (deadline: 11:59 PM). There will be a penalty of 5% applied to the mark of your paper if your table is formatted differently (and hence the TA will have to manually rework your table in order to create the large class data table) and an additional penalty of 5% if you fail to meet the data submission deadline.

Table. 1. Organization of the data table. For the identification of gender, use 1 for females and 2 for hermaphrodites.

Student name	Largest width/length in mm	Gender
Jane	38	1
Jane	43	2
Jane	39	2
Jane	38	2
Jane	22	1
Jane	24	1

(6) The TA will create the class data set. This data set will be uploaded to the dropbox course folder for you to download (availability: TBA).

1.3. Steps between your download of the class data set and the submission of your paper

You will have to, using your own time management, run the statistical analysis on the two class data sets, produce appropriate figures (one per species), understand and do research on why the two genders have different flower sizes (the same reasoning will apply for both species), read enough scientific papers to cite in your paper (see detailed instructions below) and write and submit your paper to turnitin (see detailed instructions below). I would hence strongly recommend that you not leave all the work until the last few days before the paper submission…

1.4. Data analysis

Run a T-test comparing the average size of flowers of the two genders. From the analysis, retrieve the mean flower size per gender including standard errors. Use these in your figure of your report. You can either run a T-test with whatever statistical program you are already used to or you can use a free online program, using the following step-by-step instructions.

(1) In your web browser, go to the URL:
http://www.graphpad.com/quickcalcs/ttest1.cfm?Format=C
Read the website thoroughly, and consider what boxes should be selected given the data set.

(2) Choose data entry format: How many rows of data do we have? More than 50, therefore choose the option, "Enter or paste up to 2000 rows."
(3) Enter data:
What labels should you choose? You are comparing between the size of female and hermaphrodite flowers, so use 1 for female and 2 for hermaphrodites as labels. What values do we enter? You can simply copy the rows into the "Values" section of "2. Enter data" from the excel spreadsheet.

(3) Choose a test: What test should you choose? Click on "Help me decide" to determine the test to be used for this analysis. (Hint: use the "Unpaired t test")

(4) View the results: Select "Calculate now". Your analysis is immediately calculated and returned to you on the next page. Make sure to include in your text and figure the standard error (named SEM on the website) and sample sizes. Take the two means and standard errors per species and create two figures in excel.

2. WRITING INSTRUCTIONS

The length of the text (references, figures and tables excluded) should be **1200 – 1500** and consist of the following parts

- Title
- Abstract: maximum of 200 words
- Key words: 6
- Introduction: approx. maximum of 300
- Methods: approx. maximum of 200 words
- Results: approx. maximum of 200 words
- Discussion: approx. maximum of 600 words
- References (do not count toward word count of a report)

Title. Concise title potentially containing the main finding of your study.

Abstract. The abstract should explain to the general reader why the research was done and why the results should be viewed as important. It should be able to stand alone; the reader should not have to get any information from the main paper in order to understand the abstract. The abstract should provide a brief summary of the research, including the purpose, methods, results, and major conclusions. Do not include literature citations in the abstract. Avoid long lists of common methods or lengthy explanations of what you set out to accomplish. The primary purpose of an abstract is to allow readers to determine quickly and easily the content and results of a paper. The following breakdown works well: purpose of the study (1-2 sentences), outline of the methods (1-2 sentences), results (1-2 sentences), conclusion (no introduction to this section, no discussion/guesses, no citations).

Key words. List 6 key words. Words from the title of the article may be included in the key words. Each key word should be useful as an entry point for a literature search if your report were to be published.

Introduction. A brief Introduction describing the paper's significance should be intelligible to a general reader. The Introduction should state the reason for doing the research, the nature of the questions or hypotheses under consideration, and essential background. The introduction is the place where you can show the reader how knowledgeable you are with a given field, without being too lengthy. Close the introduction with your main hypothesis/question(s).

Methods. The Methods section should provide sufficient information to allow someone to repeat your work. A clear description of your experimental design, sampling procedures, and statistical procedures is especially important.

Results. Results generally should be stated concisely and without interpretation. Present your data using figures and tables; guide your reader through them.

Discussion. The discussion section should explain the significance of the results. Distinguish factual results from speculation and interpretation. Avoid excessive review. Structure your discussion as follows. 1. First paragraph - restate your major findings concisely and then relate to the literature. 2. Discuss the problems that might have been present to influence your findings. 3. Compare your findings with those of others; examine why differences occurred and why this may have been so.

References. Use the correct format (also see the formatting of the literature in the course manual). You should search for and read related studies beyond those cited in the overview on a lab and your report should list at least 12 references.

2.2. Formatting your report, writing tips

Use the formatting style of the journal of “Ecology.” It might seem tedious to you to have to follow the many rules the journal prescribes, but adhering to one style makes a paper more organized, increases readability and bad formatting typically is a sign that the contents are also of sub-par quality.

Formatting of species names. When mentioning a species in English, also provide the Latin name, at least the first time. Latin names have to be in italics and the first time a Latin name is mentioned, the genus name (first part of the official binary name) has to be spelled out, later on it can be abbreviated, such as in the following example: “Common milkweed, *Asclepias syriaca*, is a hermaphroditic perennial common to Southern Ontario. The leaves of *A. syriaca* are toxic to cattle.”

Formatting of references. In the body of the text, references to papers by one or two authors in the text should be in full, e.g. Liang and Stehlik (2009) show *blablabla*. Or: *Blablabla* (Liang and Stehlik 2009). If the number of authors exceeds two, they should always be abbreviated; e.g. Campitelli et al. (2008) show *blablabla*. Or: *Blablabla* (Campitelli et al. 2008). If providing more than one reference in brackets, the order should be chronological with the oldest first and the younger ones later. In the case of two studies from the same year, the order should be alphabetical. E.g. Blablabla (Zuk 1963; Korpelainen 1998; Stehlik and Barrett 2005, 2006; Stehlik et al. 2008)."

All references cited (and read by you!) in the main text should be included in "Literature cited." References should be in alphabetical order and their formatting should follow the format exemplified below.

Citing articles in scientific journals:
Michaels., D. R., Jr., and V. Smirnov. 1999. Postglacial sea levels on the western Canadian continental shelf: revisiting Cope's rule. Marine Geology 125:1654-1669.

Citing whole books:
Carlson, L. D., and M. Schmidt, eds. 1999. Global climatic change in the new millennium. 2nd ed. Vol. 1. The coming deluge. Oxford Univ. Press, Oxford, U.K.

Citing individual articles/chapters in books (if the individual chapters have different authors than the book):
White, P.S. and S. T. A. Pickett. 1985. Natural disturbance and patch dynamics: An introduction. Pp. 3-13 *in* S. T. A. Pickett and P. S. White, eds. The Ecology of Natural Disturbance and Patch Dynamics. Academic Press, San Diego, California, USA.

Citing a webpage (avoid as much as possible, cite a paper or book instead):
IUCN, Conservation International, and NatureServe. 2004. Global amphibian assessment. Available at www.globalamphibians.org. Accessed October 15, 2004.

Formatting of tables. Tables (if present) should NOT be inserted in your text, but follow, one table per page, after your Literature cited. Give a brief description what the table is about (table caption) and introduce the parameters stated in the table in a text inserted above the table (see examples in all project descriptions). The description should be self-explanatory, thus the reader should not be forced to read the main body of text in order to understand the message of a table. Each column and row in the table should be labeled (with units if necessary). If mentioning a species name, provide the spelled out Latin name (in italics). In the table, round numbers to two meaningful digits.

Formatting of figures. The design of a figure should clearly convey a major result, thus scale your data appropriately. Label all axes with sufficiently large font and meaningful labels. Keep it simple; do not use unnecessary elements such as 3D diagrams if not absolutely necessary as based on the data structure. Similarly as tables, figures should NOT be inserted in your text, but follow, one figure per page, after your tables. Give a brief description what the table is about (figure caption) and introduce the parameters stated in the figure in a text inserted below the figure (see examples above). The description of the figure should be self-explanatory, thus the reader should not be forced to read the main body of text in order to understand the message of a figure. Also, each axis in a plot should be labeled (with

units) and each bar in a bar chart should be labeled. If mentioning a species name, provide the spelled out Latin name (in italics).

References to tables and figures in the text. In your text, refer to figures as follows: 'In the spring, temperatures are higher than in the winter (Fig. 1).' Or: Figure 1 shows that temperatures are higher in the spring than in the winter. In your text, refer to tables as follows: 'In the spring, temperatures are higher than in the winter (Table 1)'. Or: Table 1 shows that temperatures are higher in the spring than in the winter.

Formatting of statistical references. In the text, the results of a statistical test should be cited in parentheses, in support of a specific statement. Example: Xylem tension at the top of trees was significantly higher (25 bars) than at the bottom (20 bars) of the tree ($P < 0.05$). When mentioning the result of a statistical test, always provide the P value, R^2 or χ^2 were applicable, mean values, sample sizes and standard errors or confidence intervals. Format your text according to the following example. "There was a significant difference in the frequency of flowering between low and high elevation sites, with greater bias among low than high elevation populations (average flowering frequency: low elevation = 0.93, SE = 0.01; high elevation = 0.78, SE = 0.02; $\chi^2 = 35.04$, $P < 0.0001$; df = 1)."

Miscellaneous. Avoid quotations - paraphrase your sources instead while making sure you are not plagiarizing.

3. GENERAL GRADING SCHEME FOR REPORTS

When writing the report, you should also consider the criteria and grading scheme that will used to evaluate your report.

3.1. Information content (30%)

This portion of the grade reflects whether or not you have presented and adequately discussed all of the relevant information. This includes background information on the topic being addressed, as well as the information you have gathered (or should have gathered). Specifically, do not forget to include all relevant statistical result parameters, statistical and other tables, data figures and the written explanation of the results. Also make sure you have cited the adequate number of required articles.

27-30: All of the relevant information was included and discussed adequately.
24-26: One of the pieces of information was not included or discussed adequately.
20-23: One of the most important pieces of information was not included or discussed adequately.
15-20: Two or more of the most important pieces of information were not included or discussed adequately.
<15: Little of the important information was included or discussed.

3.2. Interpretation and persuasiveness (30%)

This portion of your grade reflects whether or not you interpreted the information correctly and provided persuasive arguments to support your interpretation. Specifically, does your reasoning make sense on its own and also in the light of the published literature, with which you compare your results?

27-30: All of the relevant information was interpreted correctly, and the arguments were very persuasive.
24-26: Most of the information was interpreted correctly, and the arguments were persuasive.

20-23: One of the important pieces of information was not interpreted correctly, or some of the arguments were not persuasive.
15-20: Two or more important pieces of information were not interpreted correctly, and some of the arguments were not persuasive
<15: Little of the information was interpreted correctly, and few of the arguments were persuasive.

3.3. Clarity of writing (20%)
This portion of the grade reflects whether or not you wrote your sentences and paragraphs clearly. In particular, do you avoid overly long sentences? Are your paragraphs succinct and mostly dealing with one major line of reasoning each? Do your paragraphs preferably start with an introductory sentence and end with a strong summarizing statement? Do you use scientific terms correctly?

19-20: Very clear
16-18: Mostly clear
14-15: Several unclear sentences
10-13: Many unclear sentences
<10: Few clear sentences

3.4. Formatting (10%)
This portion of the grade reflects whether or not you formatted your report well. This includes the overall structure, the references, and the figures and tables (see instructions above).

9-10: The entire report was formatted correctly, and looked very professional.
8-9: The report was formatted correctly, and looked fairly tidy.
7-8: There were a few formatting errors, or one of the relevant questions was not posed in the introduction.
5-7: There were several formatting errors, or several of the relevant questions were not posed in the introduction.
<5: There were many formatting errors, or few of the relevant questions were posed in the introduction.

3.5. Spelling, grammar and punctuation (10%)
This portion of the grade reflects whether or not you used correct spelling, grammar and punctuation.

9-10: There were no errors in spelling, grammar, or punctuation
8-9: There were a few minor errors
7-8: There were several minor errors, or a few major errors
5-7: There were several major and minor errors
<5: There were many errors

WRITING OF PRACTICE QUESTIONS

1. Purpose and overview

The purpose of this assignment is to encourage you to think about course material in a critical way and keep up with the lecture material throughout the course. You are expected to determine the key points underlying a given slide, and then use logic and creativity to design a good question to assess

understanding of these points. After you submit your questions, all student-created questions will be uploaded to Quercus and will form the bases (1) for the 'taking of class-written practice questions' (worth 3%) and (2) to practice for the midterm and final exams.

You are expected to write one multiple-choice-type question for each of the 24 lectures. After a particular class has happened, you have one week to upload your question. In particular, for a Tuesday (Thursday) class, you have to submit the associated question by next Monday (Wednesday) midnight, 11.59 pm.

Over the course of the 24 lectures and hence 24 questions, half or 12 questions need to be based on text-based slides and 12 on graph- or table-based slides (see examples of all types of questions below). Of these 24 questions, you can only submit a maximum of three true/false questions, all other questions need to be either 'classical multiple choice,' 'fill in the blanks,' or 'multiple true or false answers' (see examples of all types of questions below).

Use your common sense of what level of detail might be useful to engage with a slide and learn about its biology. In a sense: ask yourself what you would need to succeed in understanding and applying particular lecture material. Unless multiple slides deal with a particular plant species, species names are not relevant, but a vehicle for understanding plant adaptations and survival strategies.

2. Selection of slides

Each particular slide can only be taken by a maximum of two students and slide selection is on a first-come-first-serve basis. If there are already two questions about a particular slide by the time you are uploading your questions to the joint class file, you must write a new question about a different slide (the early bird gets the worm…).

3. How to add questions to the joint google doc file

The whole class will work on one joint online google doc file. This allows everybody to (1) see what slides have already been taken, (2) draw inspiration from the creativity from others as the course moves along, and (3) have a sneak peek at all questions forming the basis for 'taking of class-written practice questions' before they are uploaded to Quercus. In order to protect your privacy but, at the same time, allow to track who wrote which questions (for the evaluation of this assignment), you must add the last four digits of your student ID at the end of each of your questions.

4. Particular steps involved in the writing process

- Develop/write your question in a normal, non-online doc file. Once you are happy with it, copy-paste it into the joint google doc file
- Only paste the question, not the answer! Do not indicate what the correct solution of the question is!
- Add your question in the correct sequence as based on the slide number

- Add the last FOUR digits of your student ID after your question (1234)

5. Evaluation and selection of questions to be included into the pool of practice questions

The professor will decide whether your particular question is useful for student learning and hence will should added to the online Quercus pool of course practice questions. For example, if all of your 24 questions (one for each of the 24 lectures) survive this selection, you will get the full 9% allocated to the writing of questions, while if only 50% of your questions make it into the Quercus practice pool, you will get 4.5%.

The professor will give weekly feedback on your questions (i.e. why some question do not make the cut), so you should not be discouraged in the beginning if your question does make it. Generally speaking, this is not a hard assignment and my expectation is that with a little effort, most if not all of your questions will make the cut.

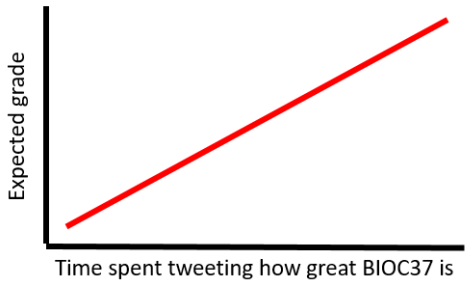
The professor reserves the right to alter or modify your questions before upload to Quercus. If your question needs to be only slightly altered, but does make it into the question bank, you will still get full credit. If the professor needs to alter your question beyond recognition, you will not get the credit.

Types of questions

(1) 'True/false'

Example for a text-based slide
BIOC37 is a course about plant adaptations to limiting evolutionary conditions (true/false) (1234 [your last four digits of your student ID])

Example for a graph-based slide
The following correlation is a correct representation on investment and expected outcome in BIOC37 (true/false) (####*)

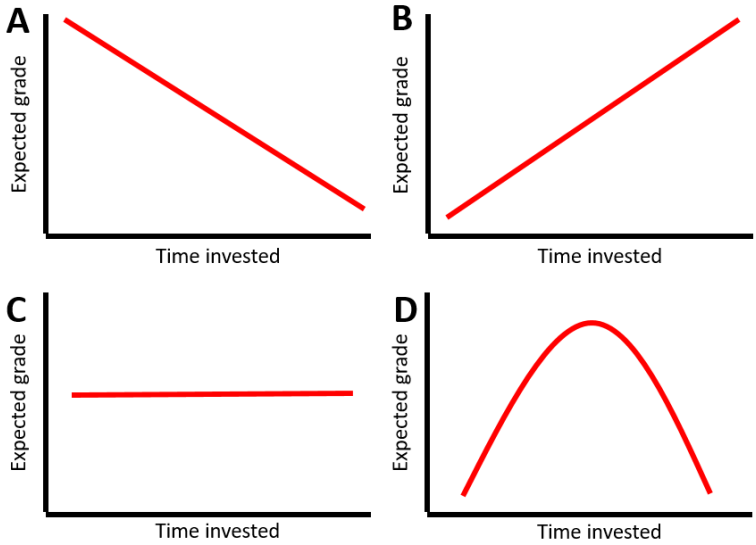


(2) 'Classical multiple choice'

Example for a text-based slide
How to increase the likelihood to do well in BIOC37? Choose the one correct answer (1234)
A. Coming to class and taking notes has no influence on your final grade

B. Lectures are video-recorded, so don't bother to come to class
C. The likelihood of passing is enhanced if you write a check over $300 and slip it under the prof's door (SW563C)
D. The prof expects you to spend many hours per week on the writing of practice questions
E. The likelihood of doing well is a function how well you keep up with weekly lectures and all assignments

Example for a graph-based slide
Which of the following represents the correct relationship between your expected grade in BIOC37 and time involved in doing assignments and studying for exams? (1234)



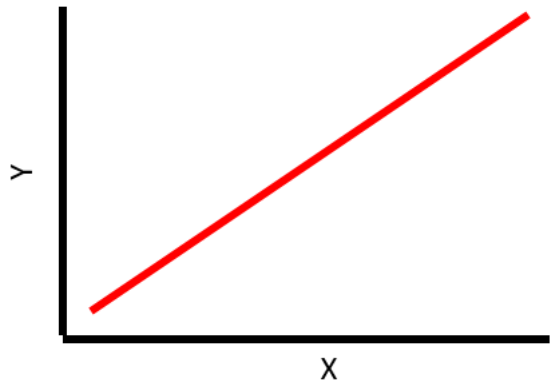
(3) 'Fill in (multiple) blanks' (with multiple options as solutions)

Example for a text-based slide
The professor put [A] into the planning of [B] in the hopes for you to [C]. Should you feel you [D], the professor [E] because [F]. (1234)

A - no effort - some effort - a lot of effort	B - her retirement - lunch choices in the food court - the course assignments and labs - ways to torture her students	C - get away with the least amount of work - be interested in the course material and learn something
D - need a coffee - need a reference letter - need a vacation - struggle	E - does not give a damn - is always willing to help you inside and outside (email!) office hours - is mean and will put you down - will sell you a coffee	F - funding is limited at UTSC - she has a coffee maker - she wants to do her part for you to do your best and succeed - you are simply on your own

Example of a graph-based slide

Fill in the most meaningful descriptors of the X and Y axes in the following graph (1234)

	X - Campus size - Students per class - Time spent studying and completing assignments - Tuition fee per semester Y - Likelihood for a long lineup at Starbucks - Likelihood for an extension on your assignment - Likelihood to ace this course - Likelihood to win the lottery

(4) 'Multiple true or false answers'

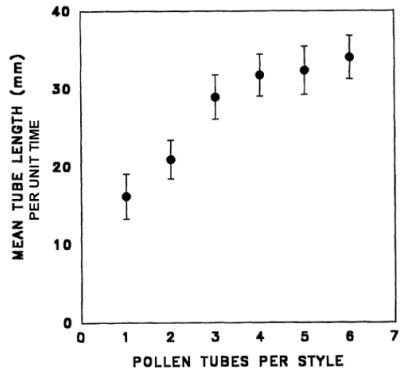
Example for a text-based slide

Choose all true descriptors about labs in BIOC37 (1234)

A. The first lab is dedicated to study the form and function of flowers
B. In the first lab, students will assess certain floral parameters and contribute to a class data set, forming the basis for the written assignment in this course
C. Only students who complete the first lab will be allowed to write the written assignment (worth 18%)
D. The second lab is about seed dispersal and will happen, for both lab groups on the same day, rain or shine, outdoors
E. In the third lab, the outdoor root walk, each student will present one particular root adaptation to the lab group, in the presence of the prof
F. In the fourth lab, an indoor lab dedicated to leaves, students will form groups of five and teach each other about leaf adaptations.
G. In this last lab, each student will have to teach their peers five subunits about leaves

Example for a graph-based slide

Choose all correct descriptors and interpretations about the following graph depicting the relationship between stigmatic pollen load and speed of pollen-tube growth (1234)

	- The more pollen grains engage in growth through a style, the faster they grow - The more styles compete in the growth through the style towards the ovule, the fiercer the competition is between male gametes for siring offspring - From a female perspective, the more pollen tubes are present in the style, the better, because the speed of pollen-tube growth is correlated with overall male quality - From a female perspective, the presence of a large number of pollen tubes in the style is negative because style can get clogged and, as a result, fertilization rate will go down

Example for a table-based slide

Choose all correct descriptors and interpretations about the following table dealing with seedling growth parameters and flower treatments (1234)

Vigor trait	Treatment: Single visit	Treatment: Open pollinated	*F*	*P*
Days to seedling emergence	10.1 ± 0.1	9.9 ± 0.1	4.36	0.0375
Days from emergence to first leaf	9.8 ± 0.2	9.4 ± 0.2	5.65	0.0180

- The faster a seedling emerges or the faster it grows its first leaf, the more likely it will outcompete other seedlings
- 'Single visit' refers to the treatment where researchers allowed just one species of pollinator to deposit pollen on a particular flower
- 'Open pollinated' refers to the treatment where flowers were allowed to receive an unlimited number of visitations of pollinators
- Open pollination is more likely to result in higher pollen loads
- Because the P values for both measured vigor traits are smaller than 0.05, this means that flowers of the with 'single visits' treatment produced seedlings of significantly higher vigor

TAKING THE PRACTICE QUESTIONS DEVELOPED BY THE CLASS

Both the midterm and the cumulative final exams will consist of (1) a mix of multiple choice (-type) questions, similar to those developed by all class members and (2) short-answer or essay-type questions. In order to help you prepare for these exams, I am nudging you to take the full practice questions as put together by you before the exams. You can expect approximately 35 questions per lecture.

For answering all questions correctly, you will get 3% towards your final grade (1.5% for the questions of lectures 1-12 and another 1.5% of questions of lectures 13-24). I am aware that these points do not amount to much, but I am implementing these points more as a nudge for you to do the smart thing… ☺

You can take these Quercus quizzes as many times as you want. Your best attempt will count. The submission deadline for the quizzes is midnight before the exams.