

Faculty of Science Course Syllabus

Department of Biology
BIOL 1010.03
Principles of Biology Part I
Fall 2024

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We support all Indigenous students in pursuit of their treaty rights.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.

We strive to make this course, and the sciences in general, a field of study where **all peoples** of various faiths, genders, race, and abilities are encouraged to understand and contribute to the pursuit of scientific knowledge.

Instructor	Office	Email	Topic
N. Gonzalez-Morales	LSC 6129	nicanor.gonzalez@dal.ca	Cell Biology
P. Côté	LSC 7124A	patrice.cote@dal.ca	Genetics and Molecular Biology
A. Simpson	LSC 5088	alastair.simpson@dal.ca	Evolution
T. Bishop		todd.bishop@dal.ca	Course Coordinator, Lab Instructor
G. Gass		gillian.gass@dal.ca	Lab Instructor
C. Course		ch608098@dal.ca	Lab Instructor

Lectures: Tuesdays and Thursdays 1:05-2:25 p.m. (section 01) or 2:35-3:55 p.m. (section 02) Ondaatje Auditorium, Marion McCain Arts & Social Sciences building. Lecture recordings will be posted on Brightspace. If gathering limits prevent the use of the auditorium, lectures will be canceled, and recordings will be posted on Brightspace. Students will be notified in advance.

Laboratories: Eight laboratory sessions, each 1hr & 50min (LSC 2097, 2098, 2100). In the event of Covid restrictions, some labs may be canceled, made optional, or moved online. Students will be notified in advance.

Absences: You do not need permission to miss lectures, but you do need permission to miss/reschedule labs or reschedule exams. **We do not need Dr's notes, so please do not visit a Dr. simply to obtain a note!!** Contact Gillian or Todd for lab permissions/reschedules or Todd for exam reschedules. See pg. 6 for more details on exam absences.

Course Description

This course, which prepares students for more advanced courses in biology and allied subjects, surveys the fundamental principles of biology with an emphasis on those features common to all organisms. Topics covered include cell and molecular biology, genetics, and evolution.

Course Prerequisites

Knowledge of high school mathematics, chemistry and biology is recommended.

Course Objectives/Learning Outcomes

Learning outcomes are provided to you as a rough guide to the most important concepts in the course. Upon completion of BIOL 1010, students should be able to:

Cell Biology

- Describe the process by which carbohydrates, lipids, and proteins are assembled from monomers and identify their functional roles in the eukaryotic cell.
- Describe the structure and function of the organelles found in eukaryotic cells, demonstrating an appreciation for the overall architecture of the cell.
- Identify the components of biological membranes, including the various types of membrane proteins.
- Understand the role of ATP as the energy currency in the cell and appreciate its importance for driving cellular work.
- List the key products and features of glycolysis, the citric acid cycle, and oxidative phosphorylation and understand the flow of energy through the entire process.
- Recall the steps relating to cell division, understand what cellular processes happen at each step, and describe the control mechanisms for the process.
- Describe the structure of the cytoskeleton in different cell types.
- List the components of the extracellular matrix.
- List the intracellular spaces where the main cellular process happens.

Genetics & Molecular Biology

- Compare and contrast the fundamental features of mitosis and meiosis with emphasis on the movement of homologous chromosomes during these cellular reproductive processes.
- Define Mendel's two laws of heredity that explain the transmission of traits from one generation to the next and provide selected examples of transmission of traits that deviate from these laws.
- Analyze human pedigrees to determine if a trait is dominant or recessive, the gene for the trait is located on an autosome or sex chromosome, and if the trait is likely controlled by a single gene or more than one gene.



- Describe the basic chemical structure of deoxyribonucleic acid (DNA) and how it differs from ribonucleic acid (RNA); what role does each molecule play in the transfer of information from genotype (DNA) to phenotype (protein) and the deciphering of the genetic code.
- Identify the regulatory elements and how they function in the control of gene expression of inducible and repressible operons in prokaryotes.
- Define the classes of physical and chemical mutagens and their effect on the coded amino acids in a polypeptide, and the resulting phenotype.
- Understand the basic principles of DNA technology/Biotechnology, its applications and the ethical and societal implications of this technological revolution.

Evolution

- Describe the basic tenets of 'Darwinian evolution': i) Tree of Life concept; ii) Natural selection, leading to adaptive evolution (including different modes of selection, and sexual selection).
- Articulate the concept of homology, and how biogeography and transitional fossils provide evidence of evolution.
- Use the Hardy-Weinberg principle to calculate expected genotype and allele frequencies (1 locus, 2 alleles).
- Define gene flow and genetic drift (and founder effect) and explain how they influence allele frequencies in populations.
- Explain the 'biological species concept', and distinguish between and give examples of i) pre- and post-zygotic reproductive barriers; ii) allopatric and sympatric speciation (e.g. polyploid speciation).
- Interpret the information in simple phylogenetic trees and taxonomies, distinguish between monophyly, paraphyly and polyphyly.
- Demonstrate an understanding of molecular phylogenetics, including the concept of tracing the evolutionary history of genes (e.g. gene duplication, horizontal gene transfer).
- Describe the most general attributes of the fossil record, including mass extinctions (with examples) and adaptive radiations.
- Describe basic concepts that explain evolution of complex features (e.g. evolution of developmental regulation; concept of exaptation)
- Describe the most basic similarities and differences between Bacteria, Archaea and eukaryotes, and the evolutionary relationships between 'protists' and animals, plants and fungi.
- Describe the phenomenon of (primary) endosymbiosis and its role in the origins of mitochondria and plastids (chloroplasts).

Laboratory

- Create scientific questions, propose a written hypothesis as a tentative answer to that question and generate observable predictions consistent with that hypothesis in the context of a particular experiment.
- Collect both quantitative and qualitative data through careful observations, report data using written descriptions, graphs, tables, and sketches, and interpret data to assess hypotheses and generate conclusions.
- Observe diversity of form, as well as key shared structures, across a range of cell and organism types.
- Design a simple experiment and identify the design elements of an existing experiment.
- Use and know when to make use of common biological research tools such as compound microscopes, gel electrophoresis units, pipettors and micropipettors, bioinformatics tools, and enzyme assays.
- Construct a phylogenetic tree using shared characters and parsimony and interpret it as a visual hypothesis about relatedness; use the tree to generate testable predictions.
- Write a properly formatted CSE-style citation for a website, article or book; quote from and/or cite published material as appropriate; read an article from a scientific journal and discuss its content with classmates
- Analyze data using basic statistical techniques (mean, standard deviation, n, chi-square test).

Course Materials

Textbook

The textbook for this course is *Campbell Biology, 4th Canadian Edition, 2024* by Urry et al. (Pearson Benjamin Cummings, Menlo Park, CA), and is available through the Dalhousie University Bookstore in e-text format. See the course Brightspace or check with the bookstore for more details. Second-hand copies of the textbook are also suitable for the class (8th, 9th, Dalhousie edition of Campbell Biology and the 1st, 2nd or 3rd Canadian editions). We may provide page numbers for readings from recent previous editions of the textbook where possible. A few copies of the text are on reserve in the Killam Library. Please plan to make regular use of the textbook. We do not use the Mastering Biology online resource that comes with new copies of the textbook for any class assignments although you are welcome to use it as an additional resource for studying.

BIOL 1010 Brightspace site

The Brightspace site is accessible at the address Dal.brightspace.com or from a link at the top of the main Dal.ca website. Login using the same information that you use to access your Dalhousie e-mail. This site provides lecture information, study aids, Powerpoint presentations from lectures, lecture recordings, online quizzes, marks for labs and exams, and important announcements. You are expected to check Brightspace, as well as your Dalhousie e-mail, multiple times a week.

Course Assessment

The exams in this course are multiple choice format and they evaluate several skills, including knowledge, comprehension, application, and analysis of information. Success in the course requires that you both remember and understand the class material. Most professors will provide practice questions and, other questions and problems are also available at the end of each chapter in the textbook.

Of the 100 marks available in BIOL 1010, 60 are allotted to the lecture component and 40 to the laboratory as follows:

Midterm exam	October 9, 2024	20% (in-person)
Final Exam (December)	Scheduled by Registrar	40% (in-person)
Laboratory *	Ongoing during semester	40% (in-person)

* The distribution of laboratory marks is described in the laboratory manual which must be purchased prior to your first laboratory session from the campus bookstore.

You must bring your Student ID card to all FINAL exams. All electronic devices, including calculators, cell phones, and electronic translators, are prohibited at exams. If English is not your first language and you require a dictionary, you may bring with you to exams a paper language-to-language translation dictionary, which must be approved by an instructor prior to use. The midterm exam only covers lecture material from the Cell Biology unit I, while the December final exam only covers lecture material from the Genetics/Molecular Biology (II) and Evolution (III) units.

The Registrar's Office has scheduled the final examination period from December 6-17, 2024. The dates, times and locations of the December exam are arranged by the Registrar's Office and posted well in advance of the end of term. It is very important that you not plan for travel during that time. Dalhousie's policy on alternative final exam times is as follows:

A student requesting an alternative time for a final examination will be granted that request only in exceptional circumstances. Such circumstances include illness or other mitigating circumstances outside the control of the student. Elective arrangements (such as travel plans) are not considered acceptable grounds for granting an alternative examination time. This policy may also be applied at the discretion of the instructor to tests and examinations other than final examinations. (Undergraduate Calendar, 2024-25). Please contact Todd Bishop, the course coordinator, to request alternate arrangements.

Other course requirements

Laboratories are usually held each week; please check the schedule in your lab manual. There are 30 students in each laboratory with one Teaching Assistant (TA) who answers questions and instructs students on how to conduct laboratory exercises; as well an Instructor is supervising three lab rooms at any one time. You must attend the laboratory in your scheduled room and time slot. There are online quizzes and assignments to be completed throughout the term. Assignments must be handed in at the end of the laboratory period. If you find it difficult to finish laboratories in the allotted time, please speak to a lab instructor. Students requiring accommodations are encouraged to speak to their TA or supervising lab instructor so that we can help you get the most out of your lab sessions.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale:

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Please note: a grade of C (60%) or better in BIOL 1010 is required for entry into several second-year biology classes (BIOL 2020, 2030, 2040 & 2004). Please note that this has changed from the previous requirement of C+ (65%). A grade of B- is required for several majors including Microbiology and Neuroscience. Other professional programs may require minimum grades as well.

Course Policies

Make-up Examinations

Make-up exams will take place after the scheduled exam, with time and location of make-up exams announced on the course Brightspace site. Make-up exams are intended for students who miss a scheduled exam **because of illness or some other legitimate reason**. They are not available to students who achieve less than their expectations on the regular examination and want to improve their mark. Students must provide appropriate documentation to the Course Coordinator within one week of the scheduled exam to write the make-up exam. Students who miss the make-up final exam due to ongoing illness may write a make-up during the first week of winter term.

There will be one makeup exam scheduled for each of the midterm and final exams. If students miss both the main exam and makeup exam, any further makeup exams will be scheduled at the discretion of the course coordinator. The course coordinator has the ability to impose a 5% reduction in exam grade for each missed exam reschedule after the main makeup exam occurs.

Absences

It is the responsibility of students who are absent from lectures and laboratories to ascertain what was missed, including announcements of tests and other information. If you miss one or more lectures for medical reasons, contact the course coordinator to discuss options for catching up on missed lecture material. Absence from a lab at which a quiz or assignment is due requires that you contact Todd or Gillian within 48 hours of your absence to avoid losing marks.

Social Connections

While going to class and studying tend to be the focus for most students, they may also want to forge relationships with members of communities they identify with. The following is a small list of communities that exist on campus to support students in their academic journeys.

2SLGBTQ+

<https://www.dsu.ca/ratified-societies-new/2023/7/5/x48ixck9n12fx3t9aau7nnq5e6d7rl-tas14-8c37h-7g66s>

Black student advising centre and other related societies and groups:

https://www.dal.ca/campus_life/communities/black-student-advising/societies-and-groups.html

Indigenous students:

https://www.dal.ca/campus_life/communities/indigenous.html

There is also a main page that provides opportunities to find other groups and get involved in campus life: https://www.dal.ca/campus_life/get-involved.html



Biology 1010 Outline of Lectures Fall 2024

Unit	Date	Topic	Textbook readings	Lecturer
	Sept 3	Welcome to BIOL 1010	Ch. 1 (<i>Not testable, but a great intro to BIOL 1010</i>)	Bishop/Gass
CELL BIOLOGY	Sept. 5	The Structure and Function of Large Biological Molecules	Please refer to the detailed "Recommended Reading" document on Brightspace!	Gonzalez-Morales
	Sept. 10	The Structure and Function of Large Biological Molecules (cont'd)		
	Sept. 12	Membranes & Organelles		
	Sept. 17	Making & Secreting Proteins		
	Sept. 19	The Cytoskeleton		
	Sept. 24	Metabolism & Energy		
	Sept. 26	The Cell Cycle		
	Oct. 1	Cell Communication		
Cell Biology Midterm Exam – Wednesday, October 9, 2024. Details to be announced.				
GENETICS & MOLECULAR BIOLOGY	Oct. 3	Mitosis and Meiosis	Please refer to the detailed "Recommended Reading" document on Brightspace!	Côté
	Oct. 9	Patterns of Inheritance		
	Oct. 10	Human Genetics		
	Oct. 15	DNA: The Genetic Material		
	Oct. 17	Genes and How They Work		
	Oct. 22	Regulation of Gene Expression; Mutation		
	Oct. 24	Gene Technology		
EVOLUTION	Oct. 29	History of Biological Evolution	Ch. 1, 22	Simpson
	Oct. 31	Evidence of Evolution	Ch. 22	
	Nov. 5	Evolution of Populations I	Ch. 23	
	Nov. 7	Evolution of Populations II	Ch. 23	
	Nov. 11-15	Fall Study Break – No Classes		
	Nov. 19	Origin of Species	Ch. 24	
	Nov. 21	Phylogenetics and Systematics	Ch. 26	
	Nov. 26	Macroevolution	Ch. 25	
	Nov. 28	Tree of Life & Microbial Diversity	Ch. 25, 27, 28	

ACCOMMODATION POLICY FOR STUDENTS

Students may request accommodation because of barriers related to learning difference, disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html)

ACADEMIC INTEGRITY

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

STUDENT CODE OF CONDUCT

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.html>

FREQUENTLY ASKED QUESTIONS

1. I am having trouble accessing the Brightspace site. How do I get help?

Contact Information Technology Services (ITS): <https://www.dal.ca/dept/its/help.html>
902- 494- HELP (902-494-4357) or toll free 1-800-869-3931. Or e-mail support@dal.ca

2. I had accommodations or adaptations in high school. Should I continue with these at university and how to I request these?

If you had them in high school, you should certainly try to continue with them in university. Contact the Accessibility Centre to ensure you can receive accommodations for your courses.

https://www.dal.ca/campus_life/academic-support/accessibility.html

3. I missed my laboratory. What should I do?

You should talk to either Todd or Gillian as soon as possible to explain your absence and attempt to reschedule to avoid losing marks.

4. I missed an exam because I was sick. What should I do about writing the make-up exam? Do I need a doctor's note?

You should contact Todd concerning permission to write the make-up exam. You DO NOT need a Dr's note.

5. My team is playing a game out of town the day of the midterm exam. What should I do about writing the make-up exam?

You should contact Todd for permission to write the make-up exam. You will need a signed note from your coach to verify the reason for your absence.

6. I have questions about the lecture material. How do I get help?

You should contact the person giving the lectures for that unit.

7. I'm not sure what material will be on the lecture exam. How do I get this information?

You should contact the person giving the lectures for that unit.

8. I have trouble with multiple choice exams. What should I do?

You may wish to attend a Study Skills Workshop on "Writing Multiple Choice Exams" offered through the Studying for Success program www.dal.ca/sfs. Students sometimes find certain types of multiple-choice questions more difficult than others. By reviewing your BIOL 1010 midterm exam, you can determine whether you tend to get a particular type of question wrong more often than other types. If so, then you should make an effort to get as much practice as possible with that form of question (e.g. do questions at the end of text chapters, talk to the professor teaching the unit regarding sample exam questions, work with friends and create practice questions).

9. May I make an audio recording of the lectures?

This is unnecessary as all lectures are automatically recorded and will be posted to the class website on Brightspace as soon as possible after the lecture.

10. I'm not satisfied with my grade in the course. Can I do an extra assignment to get more marks?

No. The labs, quizzes and exams are the only graded material in the course, so treat all coursework as important during the term.

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with <ul style="list-style-type: none"> - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties 	<i>Bissett Student Success Centre</i> Room 426, Student Union Building 6136 <u>University Avenue</u>	https://www.dal.ca/campus_life/academic-support/student-success-centre.html
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	Killam Library Ground floor	https://libraries.dal.ca
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	Killam Library, Room G28 (main floor) - call 494-3077 or - email the Coordinator at: sfs@dal.ca	https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
Writing Centre	Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster) <ul style="list-style-type: none"> - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field 	Killam Library Ground floor Learning Commons & Rm G25	https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html