

Genes & Genomes Syllabus

Department of Biochemistry & Molecular Biology

BIOC 4403 / 5403 Winter 2024

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor

Name	Email	Room
Dr. John Archibald	John.archibald@dal.ca	Room 9R1, Tupper Medical Building

Course Delivery In-person lectures, 11:35-12:25, Monday – Wednesday – Friday
Room 3A1, Tupper Medical Building

Course Description

This course discusses the organization of genes into genomes. It deals with (i) compartmentalization of genetic material in nuclear and organellar genomes, (ii) the structure, behaviour and origins of components of both nuclear and organellar genomes which are not genes (transposable and other repetitive elements, introns), (iii) methods for sequencing and analyzing genomes, and (iv) the significance of genetic organization and higher order chromosomal structure and function. The methodologies and prospects of genomics are discussed at length.

Course Objectives / Learning Outcomes

Appreciation of genomic diversity; understanding of the characteristics of, and differences between, nuclear, prokaryotic, organellar and viral genomes; understanding of the evolutionary processes that shape the coding capacity and architecture of genomes in different organisms and sub-cellular compartments; knowledge of current methods and technologies available to generate and analyze sequence data.

Course Prerequisites

BIOC 3400.03 or BIOL 3046.03 or Instructor's consent

Course Materials

Course website: Brightspace (for posting of lecture slides, suggested reading, practice materials, etc.)

Required material: Archibald, J. M. 2018. Genomics: A Very Short Introduction. Oxford University Press. ISBN: 978-0-19-878620-7. Book can be purchased at the [Dalhousie Bookstore](#) (print or e-book); new and used copies available elsewhere.

Assessment

This course assumes an intermediate level of molecular biology (BIOC 3400 or equivalent). The material is provided through lectures as well as original research and review articles and assignments. The final grade (for 4403) will be based on two in-class mid-term exams (20% each) and the final exam (60%). For BIOC5403, in addition, each graduate student is required to give an in-class presentation on a special topic (arranged with the Coordinator) that accounts for 10% of their final grade. The final presentation is graded on a 1-to-10 scale. Since the marks of the three exams and the presentation can add up to 110, the final mark is multiplied by 0.91 to obtain the final grade for the course on a 100 scale (this applies to graduate students only). Grad students need to achieve a grade of 65 or more (C+) to PASS.

Midterm I	20 %	Monday February 12 th 2024
Midterm II	20 %	Friday March 15 th , 2024
Final exam	60 %	<i>(Scheduled by Registrar)</i>

Conversion of numerical grades to final letter grades follows the [Dalhousie Grade Scale](#):

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies

Short-term absence, missed exams, midterms, or assignments, etc.

A student who misses an evaluation component of a course (e.g., a midterm test) due to illness should if possible, notify the instructor, course coordinator, or department office either prior to, or within 48 hrs of the scheduled time or due date for that component. The student must also submit a Student Declaration of Absence Form (through the course Brightspace page or to their instructor via e-mail) within three (3) calendar days following the last day of absence. Special 'make-up' tests (if offered) will normally be written within 7 calendar days after the missed test. Absence for non-medical reasons is not ordinarily acceptable unless prearranged with the instructor. A missed evaluation component for which no satisfactory arrangement has been made will be given a mark of zero. The Student Declaration of Absence form can only be submitted up to two (2) separate times per course during a term. Students who exceed this limit must inform their course instructor(s) and will be required to register with an Advisor at Student Academic Success (SAS). If students have recurring short-term absences and do not register with SAS, it is at the instructor(s)' discretion to disallow any further Student Declarations and deny alternate coursework arrangements.

Missed Final exam:

A student who misses the final examination due to illness must notify the course coordinator or department office within 48 hours to provide a medical certificate (see Dalhousie Calendar, section 16.8). Absence for non-medical reasons is not acceptable.

If necessary, a make-up final examination will be held shortly after the end of the official exam period, and typically before May 1. Students who need to write a makeup exam for medical or other reasons are expected to be available during this period.

Please refer to [this link](#) for further information on the University policy regarding Long-term absence.

Course Content — 2024

MONTH	DAY	LECTURE	LECTURE TOPIC
January	Mon 8 th	1	Course Introduction — diversity of genes and genomes
January	Wed 10 th	2	Origins of genes and genomes I
January	Fri 12 th	3	Origins of genes and genomes II
January	Mon 15 th	4	Mobile introns and inteins
January	Wed 17 th	5	Prokaryotic genomes I
January	Fri 19 th	6	Prokaryotic genomes II
January	Mon 22 nd	7	Prokaryotic genomes III (genome reduction)
January	Wed 24 th	8	Endosymbiotic theory and genomes
January	Fri 26 th	9	Organelles and their genomes I
January	Mon 29 th	10	Organelles and their genomes II
January	Wed 31 st	11	Organelles and their genomes III
February	Fri 2 nd	-	<i>NO LECTURE – Munro Day</i>
February	Mon 5 th	12	Viral genomes I
February	Wed 7 th	13	Viral genomes II
February	Fri 9 th	-	<i>Review / Q&A session</i>
February	Mon 12th	-	MID-TERM EXAM 1
February	Wed 14 th	14	Nuclear genome biology I
February	Fri 16 th	15	Nuclear genome biology II
February	19-23	-	<i>STUDY BREAK (no lectures)</i>
February	Mon 26 th	16	Genome sequencing technologies I
February	Wed 28 th	17	Genome sequencing technologies II
March	Fri 1 st	18	Metagenomics
March	Mon 4 th	19	Transcriptomics and epigenomics
March	Wed 6 th	20	Proteomics
March	Fri 8 th	21	Genome annotation and analysis I
March	Mon 11 th	22	Genome annotation and analysis II
March	Wed 13 th	-	<i>Review / Q&A session</i>
March	Fri 15th	-	MID-TERM EXAM 2
March	Mon 18 th	23	The human genome in biology and medicine I
March	Wed 20 th	24	The human genome in biology and medicine II
March	Fri 22 nd	25	Evolutionary genomics I
March	Mon 25 th	26	Evolutionary genomics II
March	Wed 27 th	27	Genomics and synthetic biology
March	Fri 29 th	-	<i>NO LECTURE — Good Friday</i>
April	Mon 1 st	28	Guest lecture — genomics and bioethics
April	Wed 3 rd	29	Special topics in genomics
April	Fri 5 th	-	Graduate student presentations
April	Mon 8 th	-	Graduate student presentations
April	Tue 9 th	-	<i>Review / Q&A session</i>

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.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

Accessibility

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) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.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>

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

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at:

https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their

work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Faculty of Science

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates):

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol:

https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies:

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803:

<https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>