

# Medical Biotechnology Syllabus

## Department of Biochemistry & Molecular Biology

**BIOC 4501/5501, Fall 2025**

*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	Office Hours
Kathryn Vanya Ewart	vewart@dal.ca	<a href="#">Book meeting</a>

### Course Description

Topics covered include (1) the history and scope of medical biotechnology, (2) genetic, molecular and analytical approaches central to medical biotechnology, (3) production of macromolecules and small molecules using cells or biological materials, (4) detection of molecules using cells or biological materials, (5) biotechnology in Atlantic Canada, and (6) responsibilities in biotechnology.

### Course Prerequisites

BIOC 3400 or instructor's permission

### Course Exclusions

Not applicable

## Student Resources/Course Material

- Study materials, including PDF lecture notes, recorded lectures, assigned readings and links to online videos are available in Brightspace.
- There is no assigned textbook.
- Research materials required for the video and product development assignments should be available through the Dalhousie library as well as through the websites of the Life Sciences Industry associations or individual companies.
- Information on companies, trade associations or other organizations shared in this course are not endorsements of those entities but are included for educational purposes only.
- Meetings within office hours are available at [Book meeting](#). Students who cannot meet in these intervals are welcome to contact me by email to schedule different meeting times.

## Course Structure

The course will involve several components.

1. **Lectures:** There will be lectures in the Tupper Medical Building, room 3H (third floor) on Tuesdays and Thursdays at 10:05 a.m.
2. **Student involvement in lecture sessions:** Some lectures will involve student participation including class discussions and student videos.
3. **Independent study:** In addition to lecture attendance, this course will require substantial independent study of the material in order to develop broadly based and in-depth knowledge of the methods and concepts covered. Preparation of assignments will also require responsible planning and time management.
4. **Communication and assistance:** Appointments for consultation or extra help can be set up by scheduling a meeting using the link above. As noted above, students who cannot meet in these intervals are welcome to contact me by email to schedule different meeting times.

## Assessment

Evaluation in BIOC 4501 will include the following components:

Component	Weight (% of final mark)	Exam date or item due date
Midterm exam	25%**	Tuesday, <b>October 28<sup>th</sup></b> , 2025 in class
Atlantic Canadian life sciences company video	22% 1% Choice of company 17% Video 4% Peer feedback	Tuesday, <b>October 14<sup>th</sup></b> , 2025* Monday, <b>November 17<sup>th</sup></b> , 2025* Wednesday, <b>December 10<sup>th</sup></b> , 2025*
Product development proposal	18%	Wednesday, <b>December 10<sup>th</sup></b> , 2025*
Final exam (cumulative)	35%**	<b>TBD</b> , within the regular final exam schedule

\*Due at 11:59 p.m. on the date indicated.

\*\*When a student earns a higher grade on the midterm than on the final exam, both exams will be adjusted to 30% for that student.

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

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

## Course Policies on Missed or Late Academic Requirements

- Assignments will be docked 20% per day if submitted late (-20% if up to 24 hours past due, -40% if 24 - 48 hours past due, etc.).
- If a student is unable to complete an exam or assignment at the scheduled time due to illness or for other valid reasons, the student must submit a **Student Declaration of Absence** form (available on Brightspace) either electronically or in printed form within 3 days of the event. A maximum of 2 declarations of absence will be accepted per student. When a declaration of absence is submitted for an assignment, students then have five extra days to complete the assignment before marks are docked as described above.
- There will be **no make-up midterm** exam. If the midterm exam is missed (with a Declaration of Absence), the final exam will count for the full grade percentage of both exams, which is 60%.
- **Travel for holidays will not be accommodated.**
- If a video feedback assignment is missed, for exceptional reasons, **the student must contact** the instructor for alternate evaluation arrangements. (A declaration of absence must also be submitted.)

## Course Policies related to Academic Integrity

- Students are expected to work independently for all assignments.

## Classroom policies

- Water and covered beverages will be permitted into the classroom; however, there will be **no food allowed** in the classroom during this course. If a student has food with them, it must be stored neatly away in a closed package or container for the duration of the class.
- All interaction among students and with the instructor should be respectful. Everyone is welcome.
- Anonymous feedback can be provided at any time over the course of the semester by completing the form at [Feedback](#).

## Learning Objectives

This course was developed to provide students with a comprehensive understanding of medical biotechnology, extending from its initial development to its current breadth. Although the foundations introduced in the course might generally remain steady over time, the current developments featured in the course will, of necessity, change frequently as a result of rapid growth and development in the field. Presentation of these videos in the Tupper Building lobby will allow staff, students, and faculty to learn about Atlantic Canadian biotechnology companies. Therefore, this assignment consists of service learning. A random selection of the videos will be shown in class as well, so that you can learn from one another and provide feedback.

At the end of this course, students will be able to:

1. Describe in general what is encompassed by medical biotechnology, from its origins to the present day,
2. Explain the molecular fundamentals and key developments in the manipulation, amplification and detection of specific stretches of DNA,
3. Describe examples of whole-organism biotechnology, including genome-wide association for trait selection, transgenic technology and the use of emerging gene editing techniques,
4. Explain how heterologous proteins can be produced in cells,
5. Explain protein engineering strategies,
6. Describe examples of metabolic engineering and cell-free systems for the production of select molecules of interest,
7. Describe examples of genetic modification or selection for environmental remediation,
8. Describe new and emerging technologies for the detection and analysis of biological molecules of interest,
9. Describe some of the current developments underway in biotechnology in Atlantic Canada,
10. Appreciate the importance of ethical benefit sharing in medical biotechnology and aspects of intellectual property protection and regulatory approval processes for products.

## Course Schedule

DATE		DAY	TOPIC
September	23 <sup>rd</sup>	Tuesday	Overview, syllabus and assignments
	25 <sup>th</sup>	Thursday	Development and general methods I
	30 <sup>th</sup>	Tuesday	No class
October	2 <sup>nd</sup>	Thursday	General methods II
	7 <sup>th</sup>	Tuesday	Transgenics and CRISPR
	9 <sup>th</sup>	Thursday	Nucleic acid sequences I
	14 <sup>th</sup>	Tuesday	Nucleic acid sequences II and Protein sequences
	16 <sup>th</sup>	Thursday	Heterologous protein production I
	21 <sup>st</sup>	Tuesday	Heterologous protein production II and Synthetic biology & Metabolic engineering
	23 <sup>rd</sup>	Thursday	Protein technologies I
	28 <sup>th</sup>	Tuesday	Midterm exam (material up and including October 21 <sup>st</sup> )
	30 <sup>th</sup>	Thursday	Protein technologies II
November	4 <sup>th</sup>	Tuesday	RNA as a novel vaccine technology
	6 <sup>th</sup>	Thursday	NMR and mass spectrometry for diagnostics
	11 <sup>th</sup>	Tuesday	No class
	13 <sup>th</sup>	Thursday	No class
	18 <sup>th</sup>	Tuesday	Artificial intelligence in biotechnology
	20 <sup>th</sup>	Thursday	Biotechnology ethics and business
	25 <sup>th</sup>	Tuesday	Student video presentations
December	27 <sup>th</sup>	Thursday	Student video presentations
	2 <sup>nd</sup>	Tuesday	Student video presentations
	4 <sup>th</sup>	Thursday	Student video presentations
	9 <sup>th</sup>	Tuesday	Student video presentations

## 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](mailto:elders@dal.ca). Additional information regarding the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](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](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](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](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](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/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.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.