

**Faculty of Science Course Syllabus**  
**Department of Biochemistry & Molecular Biology**  
**BIOC4305/5305**  
***Mechanisms of Signal Transduction***  
***Winter Term, 2021***

**Instructor(s):** Dr. Kirill Rosen

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CRC, C-308

**Lectures:** Asynchronous. Lectures will be made available to students via Brightspace as PowerPoint presentations with instructor's voice recording.

**Laboratories:** na

**Tutorials:** na

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**Course Description**

The goal of this course is to introduce key concepts of signal transduction. Topics include regulation of cell signalling by receptors and protein kinases, lipids in signalling, cell metabolism, apoptosis, autophagy, cell cycle and cell signalling in disease.

**Course Prerequisites For Undergraduate Students**

BIOC 3700, 3300.03, 3400.03

**Course Objectives/Learning Outcomes**

1. Understand the concept of signal transduction.
2. Understand the role of signalling networks in key aspects of cell biology.
3. Understand the roles of various aspects of metabolism in cellular homeostasis.
4. Identify key types of regulators of signal transduction.
5. Understand key physiological roles of apoptosis and autophagy.
5. Have an understanding of the association between cell metabolism and diabetes.
7. Understand the roles of oncogenes and tumour suppressor genes in the control of key aspects of cancer cell biology.

**Objectives/Learning Outcomes specific to 5305**

8. Learn to critically examine published studies in the field of Cell Signalling
9. Learn to write reviews on specific subjects in the field of Cell Signalling

**Course Materials**

**Textbook:** No textbook required

**Course Website:** None

### Course Assessment - BIOC 4305

Exams will be given via Brightspace on the dates indicated below and will be available to students for a fixed time period set by each instructor.

Component	Weight (% of final grade)	Date
Online quiz	5%	January 22
Online exam on TP's material	45%	February 26
Online exam on KR's material	25%	March 19
Writing assignments on AVS's material	12.5%	Deadlines will be determined by AVS
Online exam on AVS's material	12.5%	April 7

### Course Assessment - BIOC 5305

Online quiz	2%	January 22
Online exam on TP's material	38%	February 26
Online exam on KR's material	20%	March 19
Writing assignments on AVS's material	10%	Deadlines will be determined by AVS
Online exam on AVS's material	10%	April 7
Written essay	20%	Submission deadline: March 31

Exams on TP's and KR's material will represent multiple choice questions. The students will be asked to summarize select research papers and/or write reflective essays on various topics related to each AVS's lectures. Each writing assignment will be two pages long (11 pt Calibri, single spaced, one-inch margins).

Students taking BIOC 5305 will be expected to examine published studies, learn to think critically and use scientific writing style. To this end, students will write an essay.

**Essay:** Students will be expected to write a five-page essay (11 pt Calibri, single spaced, one-inch margins) summarizing the current state of knowledge on one of the topics of the course selected by course instructors. The essay will contain bibliography that is not included in the five-page essay limit. Students will be evaluated based on: clarity (10% of the essay grade), adherence to the scientific review style and grammar (20% of the essay grade), accuracy of capturing the state of the field (60% of the essay grade), and figure design and use (10% of the essay grade).

**Assignments** see above

#### Other course requirements

No other requirements

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

For undergraduate students:

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)

#### For graduate students

A+ (90-100)    B+ (77-79)    F (<70)  
A (85-89)    B (73-76)  
A- (80-84)    B- (70-72)

#### Course Policies

##### Short-term Absence/Missed exams, midterms, or assignments, etc.

A student who misses an evaluation component of a course (midterm test, assignment, presentation, lab, etc.) 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.

#### Course Content

##### Instructor(s):

Dr. Kirill Rosen (KR) (Coordinator)  
Dr. Thomas Pulinilkunnil (TP)  
Dr. Aarnoud van der Spoel (AVS)

**Lectures will be made available to students via Brightspace as PowerPoint presentations with instructor's voice recording by the dates shown below.**

January 6	Introduction to cell signalling (TP)
January 8	Carbohydrate metabolism and growth/survival pathway signalling (TP)
January 13	Amino acid metabolism and signalling (TP)
January 15	Signalling pathways in lipid metabolism (TP)
January 20	TCA Cycle and Ketone Body signalling (TP)
January 22	Randle Cycle, mitochondrial metabolism, DNA, and disease <b>(TP), ONLINE QUIZ</b>
January 27	Insulin Signal Transduction (TP)
January 29	Transcriptional effectors of insulin signalling (TP)
February 3	Mechanisms of insulin resistance (TP)
February 5	Munro Day

February 10	Adipokine signalling (TP)
February 12	Mitochondria-mediated signalling mechanisms that control apoptosis (KR)
February 17	Winter study break
February 19	Winter study break
February 24	Death receptor-mediated signalling mechanisms that control apoptosis (KR)
<b>February 26</b>	<b>Online exam on TP's material</b>
March 3	Autophagy-dependent signalling mechanisms that control cell survival (KR)
March 5	Signals generated by cell-extracellular matrix adhesion as regulators of cell survival (KR)
March 10	Signalling mechanisms that contribute to cancer progression (KR)
March 12	Cell cycle regulation - a look at senescence (AVS)
March 17	Cell cycle regulation - tissue homeostasis (AVS)
<b>March 19</b>	<b>Online exam on KR's material</b>
March 24	Sphingolipids; sphingolipid signalling and obesity (AVS)
March 26	The lipid raft concept (AVS)
March 31	G protein-coupled receptors (AVS)
April 2	Good Friday
<b>April 7</b>	<b>Online exam on AVS's material</b>

## University Policies and Statements

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

### Missed or Late Academic Requirements due to Student Absence

As per Senate decision instructors may not require medical notes of students who must miss an academic requirement, **including the final exam**, for courses offered during fall or winter 2020-21 (until April 30, 2021). Information on regular policy, including the use of the Student Declaration of Absence can be found here: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html](https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html).

### Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of 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. **Information:** [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia). **Information:** [https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.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.

**Code:** [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)

## **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

**Statement:** <http://www.dal.ca/cultureofrespect.html>

## **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 (1321 Edward St) ([elders@dal.ca](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

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

[https://www.dal.ca/academics/important\\_dates.html](https://www.dal.ca/academics/important_dates.html)

## **University Grading Practices**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

# **Student Resources and Support**

## **Advising**

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

**Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

**Indigenous Student Centre:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

**Black Students Advising Centre:** [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)

**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)

## **Academic supports**

**Library:** <https://libraries.dal.ca/>

**Writing Centre:** [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)

**Studying for Success:** [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)

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

**Fair Dealing Guidelines** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

## **Other supports and services**

**Student Health & Wellness Centre:** [https://www.dal.ca/campus\\_life/health-and-wellness/services-support/student-health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html)

**Student Advocacy:** <https://dsu.ca/dsas>

**Ombudsperson:** [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)

## **Safety**

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

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

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

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