Faculty of Science Course Syllabus
Department of Biochemistry & Molecular Biology
BIOC4305/5305
Mechanisms of Signal Transduction
Winter Term, 2020

Instructor(s): Dr. Kirill Rosen  kirill.rosen@dal.ca  CRC, C-308

Lectures: 8:35-9:55 am Monday and Wednesday
Video conferenced via Halifax Room B-C1 in Halifax and Room 224 in Saint John

Laboratories: na
Tutorials: na

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, present and discuss 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

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (% of final grade)</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Quiz</td>
<td>5%</td>
<td>January 22</td>
</tr>
<tr>
<td>In-class exam on TP's and PK's material</td>
<td>40%</td>
<td>February 24</td>
</tr>
<tr>
<td>In-class exam on AVS' material</td>
<td>30</td>
<td>March 16</td>
</tr>
<tr>
<td>In-class exam on KR's material</td>
<td>25%</td>
<td>April 2</td>
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Course Assessment - BIOC 5305

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<thead>
<tr>
<th>Component</th>
<th>Weight (% of final grade)</th>
<th>Date</th>
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<tbody>
<tr>
<td>Quiz</td>
<td>1%</td>
<td>January 23</td>
</tr>
<tr>
<td>In-class exam on TP's and PK's material</td>
<td>30%</td>
<td>February 25</td>
</tr>
<tr>
<td>In-class exam on AVS' material</td>
<td>25%</td>
<td>March 17</td>
</tr>
<tr>
<td>In-class exam on KR's material</td>
<td>20%</td>
<td>April 1</td>
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<tr>
<td>Critical seminar</td>
<td>10%</td>
<td>March 30</td>
</tr>
<tr>
<td>Written essay</td>
<td>14%</td>
<td>Submission deadline: March 1</td>
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Students taking BIOC 5305 will be expected to interpret experimental data, learn to think critically and use scientific writing style. To this end, students will give a seminar and write an essay.

Seminars: A seminar will be completed in the second half of term, during which the student will present a manuscript on one of the topics of the field. Manuscripts will be selected by course instructors. Each presentation will take 20 minutes in length plus 5 minutes for questions. Students are expected to interpret all experimental data, understand the contribution of the work to the field and identify shortcomings of the study. Students will be evaluated based on comprehension of the presented material, responses to questions as well as their presentation style (audiovisual, voice, mannerisms).

Essay: Students will be expected to write a 5-page essay (by last day of class) summarizing the current state of knowledge on one of the topics of the course selected by course instructors. Students will be evaluated based on: clarity (10%), adherence to the scientific review style and grammar (20%), accuracy of capturing the state of the field (60%), and figure design and use (10%).

Assignments na

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)
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. Petra Kienesberger (PK)
Dr. Aarnoud van der Spoel (AVS)

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 (PK)
January 20  Signalling pathway in Randle cycle and ketone body metabolism (TP)
January 22  Mitochondrial metabolism, structure, DNA and diseases (TP), QUIZ
January 27  Insulin Signal Transduction (PK)
January 29  Transcriptional effectors of insulin signalling (PK)
February 3  Mechanisms of insulin resistance (PK)
February 5  Adipokine signalling (PK)
February 10  Cell cycle regulation - a look at senescence (AVS)
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>February 12</td>
<td>Cell cycle regulation - tissue homeostasis (AVS)</td>
</tr>
<tr>
<td>February 24</td>
<td>Sphingolipids; sphingolipid signalling and obesity (AVS)</td>
</tr>
<tr>
<td><strong>February 26</strong></td>
<td><strong>In-class exam on TP's and PK's material</strong></td>
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<tr>
<td>March 2</td>
<td>Mitochondrial sphingolipid metabolism (AVS)</td>
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<td>March 4</td>
<td>The lipid raft concept (AVS)</td>
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<td>March 9</td>
<td>G protein-coupled receptors (AVS)</td>
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<tr>
<td>March 11</td>
<td>Mitochondria-mediated signalling mechanisms that control apoptosis (KR)</td>
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<tr>
<td>March 16</td>
<td>Death receptor-mediated signalling mechanisms that control apoptosis (KR)</td>
</tr>
<tr>
<td><strong>March 18</strong></td>
<td><strong>In-class exam on AVS' material</strong></td>
</tr>
<tr>
<td>March 23</td>
<td>Autophagy-dependent signalling mechanisms that control cell survival (KR)</td>
</tr>
<tr>
<td>March 25</td>
<td>Signals generated by cell-extracellular matrix adhesion as regulators of cell survival (KR)</td>
</tr>
<tr>
<td>March 30</td>
<td>Signalling mechanisms that contribute to cancer progression (KR)</td>
</tr>
<tr>
<td><strong>April 1</strong></td>
<td><strong>In-class exam on KR's material</strong></td>
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</tbody>
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Faculty of Science Course Syllabus (Section B)

**BIOC4305/5305**

**Mechanisms of Signal Transduction**

**University Policies and Statements**

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

**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

**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

**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.


**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’kmag 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).

Information: 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

**University Grading Practices**

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

**Missed or Late Academic Requirements due to Student Absence (policy)**

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html
Student Resources and Support

Advising

General Advising: 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

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

International Centre: 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

Studying for Success: 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

Student Advocacy: https://dsu.ca/dsas


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