

**Faculty of Medicine Course Syllabus (Section A)** (revised April 2022)**Department of Pathology**  
**PATH5040/MIC15040/BIOC5503**  
**“Pathobiology of Cancer”**  
**Winter/2022**

*Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.*

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

**Instructor(s):** *Dr. Graham Dellaire; [dellaire@dal.ca](mailto:dellaire@dal.ca) - Virtual Office hours by appointment on TEAMS*

**Lectures:** *Tuesday and Thursdays 2-4 pm*

**Laboratories:** *N/A*

**Tutorials:** *N/A*

**Course delivery:** *In-person and/or Online (synchronous or asynchronous), Blended*

*Lectures are not recorded unless provided as a video by the instructor*

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**Course Description :** This course will outline the pathobiology of neoplasia. It will discuss both normal and abnormal mechanisms of cell growth and differentiation since cancer is ultimately a disease of these processes. The course will be updated in 2012 to include animal tumour models, drug discovery, pediatric cancers, cancer initiating stem cell theory, viral carcinogenesis, inflammation and cancer, and a broader discussion of the role of DNA repair pathways in cancer development and treatment. The basic biology of carcinogenesis and behaviour of tumours will be highlighted as well as the clinical aspects of cancer management, including the use of biological markers and gene expression profiling to diagnose, stage and personalize cancer treatment. Objective: To provide graduate students and residents with an overview of the molecular events that give rise to cancer but with a strong emphasis on the clinical aspects of cancer diagnosis and treatment through expert lectures by both clinicians and cancer researchers. Format: This is a 12 week course. For weeks 1-11, class will meet twice a week for 1.5 hours, where the first hour is a lecture followed by a 20 min student seminar presentation (with 10 min for questions) for a total of 3h contact time per week. The course concludes with a 2 hour final exam in week 12. (23 lectures total) Basis of Evaluation: Previously this course relied on a single 33 question multiple choice final exam. Evaluation of the revised course will be more balanced between one written term paper (20 pages double spaced, excluding references)(30%), two 20 min journal-club style presentations on a research article (30%), and a 2 hour final exam of 20 multiple choice/matching questions, 6 short-answer written questions (selected from 8 possible) and 2 short essay questions (selected from 4 topics)(40%).

**Course Prerequisites**

*B.Sc. or equivalent degree*

**Course Exclusion**

*N/A*

## Learning Objectives

To provide graduate students and residents with an overview of the molecular events that give rise to cancer but with a strong emphasis on the clinical aspects of cancer diagnosis and treatment through expert lectures by both clinicians and cancer researchers. Upon completion of the course, students will:

- Be able to critically assess the scientific literature and present a robust summary of a scientific paper
- Be able to write a critical review on a topic of their choosing related to cancer
- Understand the key concepts of cancer development, progression and treatment from molecular and genetic aspects to surgical, chemotherapy and radiological therapies.

## Course Materials

- **Readings are taken from the following text books:**
  - **Cancer Genomics: From Bench to Personalized Medicine.** Ed. Dellaire, Berman, Arceci., 2014 Elsevier Inc, London
  - **DNA Repair and Mutagenesis** 2nd Ed. Ed. Frieberg et al., 2006 ASM Press, Washington
  - **The Biology of Cancer**, Ed. Weinberg, 2007 Garland Science, Taylor & Francis Group, LLC, New York.
- *Course Brightspace page:* <https://dal.brightspace.com/d2l/home/232423>
- **Individual guest lecturers will also provide readings for seminar presentations**

## For online/blended course delivery:

- Min. Technology: laptop equipped with a web cam and microphone, MS EAMS software
- If there is an issue with TEAMS, slides of the lecture will be provided as a PDF
- Lectures will be delivered synchronously, and students are encouraged to attend, if they miss a lecture only a PDF of the slides will be provided
- A room has been booked (G36 in the Tupper Link), should the students prefer to attend in person, but lectures may be given on TEAMS at the choice of the individual lecturers.

## Course Assessment

Assessment	Weight (% of final grade)	Date
<i>Seminar Assignments</i> <sup>1</sup>	min of two seminar assignments on scientific papers (30%)	TBA
<i>Term Paper/Review Article</i> <sup>2</sup>	one term paper/scientific review (30%)	Nov . 10, 2022
<i>Final exam</i> <sup>3</sup> – format:	Multiple choice and short answer exam (40%)	Dec. 1, 2022

## Notes

- <sup>1.</sup> *Students seminar mark (30%) will take into account attendance and participation in all seminars and lectures. Students should be prepared to ask at minimum two questions for each seminar paper. Due dates will be assigned during the first week of class.*

2. *The review should be written in the style of Nature Reviews in Cancer, and are 20 pages double spaced (1 inch margins all around, 12 point font) excluding references and must contain at least 1 figure. Only the first figure counts as part of the 20 pages.*
3. *The Final exam will be 90 min and will be written in-person in Rm G36 on Dec. 1 from 2 pm until 3:30 pm.*

**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)		

**Course Policies on Missed or Late Academic Requirements*****Policies on missed or late academic requirements, including late or missed assignments or exams.***

- *Students should inform the instructor (G. Dellaire) if they will miss an assignment or lecture and provide the reasons as to why. At the discretion of the instructor the student will be allowed to “make up” the seminar or to provide a late assignment at a future date.*
- *Late assignments (the 20 page review article) will incur a 20% penalty per day late if an adequate reason is not provided for the delay.*

**Course Policies related to Academic Integrity**

*Students are expected to adhere to academic standards with respect to plagiarism, and if suspected, plagiarism software (e.g., URKUND) will be used to evaluate written assignments.*

**Course Content**

*See attached Course Outline/Timetable.*

**Dalhousie University, PATH5040/MICI5040/BIOC5503, Pathobiology of Cancer  
Course Outline/Schedule 2022**

DATE	TIME	TOPIC	LECTURER	FORMAT
Tues Sept 6	2-4PM	<b>Lecture 1:</b> Introduction to Pathobiology of Cancer (Course over-view) assignment of papers for – Advances in Cancer Biology – student presentations	Graham Dellaire	G36, Tupper Link
Thu Sept 8	2-4PM	<b>Lecture 2:</b> Cancer, Genome Instability, DNA Damage and Repair	Graham Dellaire	G36, Tupper Link
Tues Sept 13	2-4PM	<b>Lecture 3:</b> Molecular Mechanisms of Cancer, A: Cell Cycle Control and Checkpoints I	Jayne Salsman	G36, Tupper Link
Thu Sept 15	2-4PM	<b>Lecture 4:</b> Neoplasia in the Pathology Laboratory (incl. microscopy session)	Offman/Bethune	<b>Room 728, Mackenzie Building, CDHA</b>
Tues Sept 20	2-4PM	<b>Lecture 5:</b> Molecular Mechanisms of Cancer, A: Cell Cycle Control and Checkpoints II	Jayne Salsman	G36, Tupper Link
Thu Sept 22	2-4PM	<b>Lecture 6:</b> Molecular Mechanisms of Cancer, D: Stem Cell Biology and Cancer I Solid Tumours	Paola Marcato	G36, Tupper Link
Tues Sept 27	2-4PM	<b>Lecture 7:</b> Molecular Mechanisms of Cancer, B: Oncogenes and Tumour Suppressors I	Greg Fairn	G36, Tupper Link
Thu Sept 29	2-4PM	<b>Lecture 8:</b> Immunopathology of Cancer, Cancer Immunity:	Brent Johnston	G36, Tupper Link
Tues Oct 4	2-4PM	<b>Lecture 9:</b> Cancer Epigenetics	Graham Dellaire Paola Marcato	G36, Tupper Link
Thu Oct 6	2-4PM	<b>Lecture 10:</b> Molecular Mechanisms of Cancer, C: Angiogenesis and Autophagy	Stephen Lewis	G36, Tupper Link
Tues Oct 11	2-4PM	<b>Lecture 11:</b> Clinical Management of Neoplasia, A: Surgery	Carman Giacomantonio	G36, Tupper Link
Thu Oct 13	2-4PM	<b>Lecture 12:</b> Molecular Mechanisms of Cancer, D: Stem Cell Biology and Cancer II Hematopoietic Malignancies	Amy Trottier	G36, Tupper Link
Tues Oct 18	2-4PM	<b>Lecture 13:</b> Molecular Mechanisms of Cancer, B: Oncogenes and Tumour Suppressors II	Kirill Rosen	G36, Tupper Link
Thu Oct 20	2-4PM	<b>Lecture 14:</b> Molecular Mechanisms of Cancer, E Viral Oncogenesis	Jayne Salsman	G36, Tupper Link
<b>Tues Oct 25</b>	<b>2-4PM</b>	<b>SPARE LECTURE/STUDY DAY</b>		
Thu Oct 27	2-4PM	<b>Lecture 15:</b> Clinical Management of Neoplasia, B: Radiation Oncology	Mal Rajaraman	G36, Tupper Link
Tues Nov 1	2-4PM	<b>Lecture 16:</b> Immunopathology of Cancer B: Inflammation and Metastasis	David Waisman	G36, Tupper Link
Thu Nov 3	2-4PM	<b>Lecture 17:</b> Cancer Genomics and Biomarker Use and Discovery	Graham Dellaire	G36, Tupper Link
<b>Tues Nov 8</b>	<b>2-4PM</b>	<b>BHCRI Atlantic Cancer Conference No Class</b>		
<b>Thu Nov 10</b>	<b>2-4PM</b>	<b>Lecture 18:</b> Clinical Management of Neoplasia C: Chemotherapy <b>Review Article Due</b>	Alison Wallace	G36, Tupper Link
Tues Nov 15	2-4PM	<b>Reading Break No Class</b>		
Thu Nov 17	2-4PM	<b>Lecture 19:</b> Medicinal Chemistry and Anti-Cancer Drug Discovery	Stephen Bearn	G36, Tupper Link
Tues Nov 22	2-4PM	<b>Lecture 20:</b> Mechanisms of Radiation and Chemotherapy Resistance	Shane Harding (U of T)	G36, Tupper Link
Thu Nov 24	2-4PM	<b>Lecture 21:</b> Neoplasia in the Pathology Ethics (In class evaluations)	Christy Simpson	G36, Tupper Link
Thu Dec 1	2-4PM	<b>Final Exam</b>		G36, Tupper Link – Timed 90 min

**Course Evaluation:** Paper 30%, Presentations 30%, Final Exam 40%

**Faculty of Science Course Syllabus (Section B) (revised April-2022)  
Fall/Winter 2022-23**

***PATH5040/MICI5040/BIOC5503 "Pathobiology of Cancer"***

Please ensure that the following information on University Policies is available to all students in your course. This document should be sent to students in your course along with your Course Syllabus, Section A, or may be copied into your **Course Syllabus (Section A)**.

## **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](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://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False>

### **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)

**Faculty of Science Course Syllabus (Section C) (revised April-2022)****Fall/Winter 2022-23*****PATH5040/MICI5040/BIOC5503 "Pathobiology of Cancer"***

Please ensure that the following information on Student Resources is available to all students in your course. This document should be made available to students on the course Brightspace page, or elements may be copied into your [Course Syllabus](#).

**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/undergrad-students/degree-planning.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.html](https://www.dal.ca/campus_life/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>

**Dalhousie COVID-19 information and updates:** <https://www.dal.ca/covid-19-information-and-updates.html>