

Molecular Genetics Graduate Topic Course

Course Title: Cancer Genetics MMG1316H S

Course Location:

Mount Sinai Hospital, Sinai Health System
600 University Ave.
Room 1062, 10th floor Murray Street elevators

Course Time and Date: 6 Thursdays, Feb 25th, March 4th, 11th, 18th or 25th, April 1st, April 8th or April 15th. 2027
2:00pm-4:00pm

Course Instructor(s): Daniel Schramek/Irene Andrulis

Instructor Contact Information (email): Schramek@lunenfeld.ca; ANDRULIS@lunenfeld.ca

Additional Lecturers (list name, email, Department):

Dr. Peter Dirks, Molecular Genetics
Dr. David Malkin, Institute of Medical Science
Dr. Hartland Jackson, Molecular Genetics
Dr. Kieran Campbell, Molecular Genetics
Dr. Alissa Greenwald, Molecular Genetics

Course Overview:

This course will focus on recent advances in cancer molecular genetics and application to human disease. Specifically, we will address genetic factors with respect to cancer susceptibility (tumor suppressor and DNA repair genes), tumor-specific genomics and gene expression (tumor suppressor genes and oncogenes), and therapies targeting this knowledge. Within each area, clinical application and relevance will be emphasized. Scientific tools that enable this research will be addressed, such as statistical genetics, expression profiling, genomic screens, spatial transcriptomics, and siRNA approaches to targeted therapies. The course will consist of lectures and presentations and discussion by students of selected publications. The course grade will be based on presentations, participation in discussions and a short written paper.

Course Objectives:

- Provide an introduction to the diversity of Cancer Genetics in various Cancers.
- Define key concepts in cancer research and experimental approaches in basic as well as clinical cancer research
- Survey central mechanisms in tumor cell intrinsic as well as extrinsic/microenvironmental cancer biology.
- Introduce concepts of cancer therapies and resistance mechanisms.
- Examine experimental models of cancer research.

- Spatial and single cell analysis of cancer heterogeneity

Marking Scheme:

- Presentation 40%
- Paper 40%
- Participation in discussion 20%

Policy for any absence: If you anticipate missing a class you must let the instructor know in advance, given the weight on participation and the fact that there are only six classes. Providing that you had a legitimate reason for missing the class, you will be provided with an assignment based on the reading for that week that you can use to make up for the lost class.

The basic outline for what will be covered in the six weeks is below. Assigned reading will be sent out the week in advance. In addition to the research articles, a review article will be distributed that is meant to provide a bit of context for the lecture for those students with less background and will not be a specific point of discussion

The basic outline for what will be covered in the six weeks is below (provide the information as indicated below). Assigned reading will be sent out the week in advance. In addition to the research articles, a review article will be distributed that is meant to provide a bit of context for the lecture for those students with less background and will not be a specific point of discussion.

Week 1: February, 25, 2027, 2-4PM

Overview of course

Lecturers: Andrulis/Schramek

Additional lecturer: TBD

Week 2: March, 4, 2027, 2-4 PM

2 Student presentations:

e.g. Breast and other Cancer stem cells

Sequencing of tumor genomes

Additional lecturer: TBD

Week 3: March, 11, 2027, 2-4 PM

2 Student presentations:

e.g. Tumor suppressor genes, 2-hit hypothesis

DNA damage response

Additional lecturer: TBD

Week 4: March 18 or 25, 2027, 2-4PM

3 Student presentations:

e.g. Tumor microenvironment

Cell free and circulating tumor DNA

Immunotherapy: Checkpoint blockade, PDL1, CTLA4, ACT,
oncolytic viruses, immune editing etc.

Receptor tyrosine kinases as drug targets

Additional lecturer: TBD

Week 5: April 1, 2027, 2-4PM

3 Student presentations:

e.g. Cancer progression/colon cancer

Hereditary breast and other cancer

Single-cell sequencing

Additional lecturer: TBD

Week 6: April 8 or 15, 2027, 2-4PM

3 Student presentations:

e.g. Gene expression profiling to detect alterations

Genome wide association studies and epigenetics

Micro RNAs as oncogenes and ts genes

BRCA mutant cells as therapeutic targets

Additional lecturer: TBD

Class presentations: Topics for the presentations within the respective date of the topic presentation will be distributed. Papers will be sent 1 week in advance of the presentation. There will be a short feedback session for the presenters after each class.

Assignment: For the assignments, students will write a review or a grant proposal for a topic of their choice. It should be 5 pages long excluding references and figures (0.75" margin, Arial font size 12, 1.15 line spacing). This assignment will be due 3 weeks after last class. Late submissions of grants or invited reviews will not be accepted (leading to a 40% decrease in overall grade).