

MGY428H1 F

Functional Genomics

Fall 2025 Syllabus

Course Meetings

MGY428H1 F

Section	Day & Time	Delivery Mode & Location
LEC0101	Tuesday, 1:00 PM - 2:00 PM	In Person: MS 4279
	Thursday, 1:00 PM - 2:00 PM	In Person: MS 4171

Refer to ACORN for the most up-to-date information about the location of the course meetings.

Course Contacts

Course Coordinator: Dr. Philipp Maass

Email: philipp.maass@sickkids.ca

Office Hours and Location: By appointment only

Course Overview

A broad-ranging course that covers many aspects of genomics and functional genomics, which is the discipline of defining and attributing function to all of the heritable material of an organism on a genome-wide scale, as applied to invertebrates and vertebrates. The primary and review literature will be the basis of all lectures.

MGY428 Functional Genomics covers many aspects of genomics, which is the discipline of defining and attributing function to all of the heritable material of an organism on a genome-wide scale. The course encompasses different components of the enterprise, including sequencing, genome annotation, forward and reverse genetics, mapping and interpreting regulatory sites and mechanisms, and proteomics. It also covers different technologies, data analysis and visualization, and several eukaryotic models that are used to explore genome function. The primary and review literature are the basis of all lectures – there is no textbook.

Course Learning Outcomes

Aim of the course is to understand the interdisciplinary relationships between experimental tools, biological systems, and large-scale data analysis and designing meaningful experimental pipelines to explore genome function.

Prerequisites: BCH210H1/BCH242Y1; BIO260H1/HMB265H1;

MGY311Y1/CSB349H1/BCH311H1

Corequisites: None

Exclusions: None

Recommended Preparation: None

Credit Value: 0.5

Marking Scheme

Assessment	Percent	Details	Due Date
Midterm 1	25%	The midterm 1 exam will take place during class time. It will be 50 minutes long and will consist of a roughly even mix of multiple choice questions, short answer questions, and long answer questions. It will cover all the lectures up to each of the midterm exams. Not submitting midterm exams will lead to 100 % penalty and considered as missed assignment.	2025-09-25
Midterm 2	25%	The midterm 2 exam will take place during class time. It will be 50 minutes long and will consist of a roughly even mix of multiple choice questions, short answer questions, and long answer questions. It will cover all the lectures up to each of the midterm exams. Not submitting midterm exams will lead to 100 % penalty and considered as missed assignment.	2025-11-04
Quizzes	25%	<ul style="list-style-type: none">• Each class will start with a short quiz (usually three straightforward multiple-choice questions) that test whether you have read the provided paper and recall the main points of the paper.• There are 21 "content" lectures in which there will be a quiz.• To avoid having to track and evaluate illnesses and occasional justified absences, etc., for dozens of students – and also issues with	No Specific Date

Assessment	Percent	Details	Due Date
		internet connectivity - everyone gets two free passes (i.e. their two worst quiz marks will be given full value). This is true even if the student was absent that day. These free passes are intended to compensate for the fact that not everyone can attend every single lecture. If you find yourself missing more than two lectures, then we will engage more formal mechanisms. • If >60% of the class fills out the final course evaluation, everyone will get three free quiz passes instead of two (see "Final course evaluation" section below).	
In-Person Final Exam	25%		Final Exam Period

Late Assessment Submissions Policy

Quizzes are time-sensitively scheduled at the beginning of each lecture. Not submitting quizzes and/or midterm exams will lead to 100 % penalty and considered as missed assignment.

Course Schedule

2025-MGY428 H1 Schedule

Section 1: Introductory Material (Dr. Maass)

Tue Sep 02 – Lecture 1. Introduction to course; functional genomics; model systems, overview of genomics and proteomics techniques/approaches, ethics in genomics, career options

Section 2: The Human Genome and Vertebrate Genomics (Dr. Maass)

Thu Sep 04 - Lecture 2. The human genome: sequence, overview, and annotation

Tue Sep 09 – Lecture 3. The human genome: genes, transcripts, and “functional elements”

Thu Sep 11 - Lecture 4. Jared Browning: Human genetics - positional cloning to personal genomics

Tue Sep 16 - Lecture 5. Vertebrate comparative genomics and "*in vitro*" human functional genomics

Thu Sep 18 - Lecture 6. Transcription factors, chromatin, and epigenetics: measuring regulatory sites *in vivo* and *in vitro*

Tue Sep 23 - Lecture 7. ENCODE and long non-coding RNAs

Thu Sep 25 – Midterm 1 (during class time) (25%) – scores returned by Oct 06

Section 3: Invertebrates, Networks, and Comparative Genomics (Dr. Fraser)

Tue Sep 30 - Lecture 8. Introduction to Yeast, Worms and Flies as Genomic Model Systems

Thu Oct 02 - Lecture 9. RNAi screening in worm and fly

Tue Oct 07 - Lecture 10. High-content assays, cellular phenotyping, and CRISPR

Thu Oct 09 – Lecture 11. High resolution transcriptomics as a phenotyping tool

Tue Oct 14 - Lecture 12. Biological networks and Predicting gene function

Thu Oct 16 - Lecture 13. Population genetics in model organisms

Section 4: Post-Transcriptional Gene Regulation and Sequencing (Dr. Blencowe)

Tue Oct 21 - Lecture 14. RNA-binding proteins and post-transcriptional gene regulation

Thu Oct 23 – Lecture 15. Alternative splicing: regulation and evolution

October 27 – October 31 – Reading week (no course)

Tue Nov 04 – Midterm 2 (during class time) (25%) – scores returned by Nov 14

Section 4: Post-Transcriptional Gene Regulation and Sequencing (Dr. Blencowe)

Thu Nov 06 - Lecture 16. Sequencing technologies and scRNA-seq

Tue Nov 11 – Lecture 17. CRISPR-Cas genome manipulation and applications

Section 5: Proteomics, Mass Spectrometry and Course Conclusion

(Dr. Montenegro Burke)

Thu Nov 13 - Lecture 18. Introduction to mass spectrometry instrumentation

Tue Nov 18 - Lecture 19. Principles and applications of proteomics

Thu Nov 20 - Lecture 20. Principles and applications of metabolomics and lipidomics

Tue Nov 25 - Lecture 21. Advanced topics in mass spectrometry

Thu Nov 27 – summary / review Dr. R. Montenegro

Final exam (25%) – scheduled by A&S

Policies & Statements

Students with Disabilities or Accommodation Requirements

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting <https://studentlife.utoronto.ca/department/accessibility-services/>. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

Religious Accommodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (such as a test or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

Specific Medical Circumstances

If you become ill and it affects your ability to do your academic work, consult me right away. Normally, I will ask you for documentation in support of your specific medical circumstances. This documentation can be an Absence Declaration (via ACORN) or the University's Verification of Student Illness or Injury (VOI) form. The VOI indicates the impact and severity of the illness, while protecting your privacy about the details of the nature of the illness. If you cannot submit a VOI due to limits on terms of use, you can submit a different form (like a letter from a doctor), as long as it is an original document, and it contains the same information as the VOI (including dates, academic impact, practitioner's signature, phone and registration number). For more information on the VOI, please see <http://www.illnessverification.utoronto.ca>. For information on Absence Declaration Tool for A&S students, please see <https://www.artsci.utoronto.ca/absence>.

If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

Quercus Info (if using)

This Course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. New information and resources will be posted regularly as we move through the term. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>. SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

Academic Integrity

All suspected cases of academic dishonesty will be investigated following procedures outlined in the [Code of Behaviour on Academic Matters \(https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019\)](https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019). If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to me. Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources. For example, to learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at <http://www.writing.utoronto.ca>. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see [A&S Student Academic Integrity \(https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity\)](https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity) and the [University of Toronto Website on Academic Integrity \(https://www.academicintegrity.utoronto.ca\)](https://www.academicintegrity.utoronto.ca).

Additional Content

Notes regarding lectures

- Lecturers will post their lecture materials as pdf documents on Quercus, ahead of time if possible.
- Lecturers expect best respectful and inclusive practices of listening, conversation, and debate in the classroom.
- Students should be aware that: (1) Faculty will not provide lecture recording postings or handouts; this is something we do to make the course easier to follow. (2) The lecture itself is the primary conduit of information. (3) The lecture may not follow the posted materials exactly, and the lectures are likely to contain information that cannot be gained from the slides alone or the assigned reading material. (4) Exams are likely to include information that is not found on lecture slides.

- The individual lecturers can decide whether to allow recordings for in-person classes. Distribution of any class recordings (e.g. posting online) without permission constitutes an academic offence.
- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.