MGY420H1
Regulation of Gene Expression
The participants in this course will discuss selected topics dealing mainly with regulatory mechanisms that control gene expression by RNA polymerase II in eukaryotes. Topics will include: assembly of the initiation complex; roles of transcription factors, co-activators and *cis*-acting regulatory elements; promoter escape; mechanisms that control elongation and termination of transcription; chromatin control of transcription; post-transcriptional regulation; regulatory RNAs; single cell methods; and stochastic effects. The course will be structured so as to have an introductory lecture on a specific topic in one class followed by the next class being a participatory discussion of pre-assigned research papers in which all students will have prepared themselves to present any of the individual figures from the assigned papers.
Exclusions: BIO477H5 (UTM)
Prerequisites: MGY311Y1/MGB311Y1/BCH311Y1

Course Coordinator: Jack Greenblatt
Dates Offered: Mondays and Wednesdays, Sept.-Dec. 2025
Location: Rm 255 in the Student Commons (SU) Building on Mondays and Wednesdays
Time: 11:00 am for lectures; 11:00 am or 12:00 noon for discussions.
See course outline.

MGY420H-F
REGULATION OF GENE EXPRESSION
2025

Days and Times: Monday and Wednesday; 11:00 am for lectures; 11:00 am or 12:00 pm for discussions.

Place: Room 255 in the Student Commons Building (SU)

Instructors:

Dr. Marc Meneghini, MaRS Centre, West Tower, Rm 1532, 416-978-7578,
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Dr. Jack Greenblatt (coordinator), Donnelly CCBR, Rm 906, 416-978-4141, jack.greenblatt@utoronto.ca

Dr. Eric Campos, Hospital for Sick Children Peter Gilgan Centre, Rm 14-9706, 416-813-7400,
eric.campos@sickkids.ca

The participants in this course will discuss selected topics related to gene regulatory mechanisms with an emphasis on the control of transcription by RNA polymerase II in eukaryotes. Topics may include: assembly of the initiation complex; roles of transcription factors, co-activators (e.g. Mediator) and *cis*-acting regulatory elements (e.g. enhancers, insulators); gene silencing; promoter escape; post-transcriptional regulation; mechanisms that control transcript elongation, termination, translation (e.g. regulatory RNAs), turnover, and modification; single cell experiments; and stochastic effects. The course will be structured so as to have an introductory lecture on a specific topic in one class followed by the next class being a participatory discussion of pre-assigned research papers in which all students will have prepared themselves to present any of the individual figures from the assigned papers. The focus of the course will NOT be on comprehensive coverage of transcriptional regulatory mechanisms but rather on opportunities for students to explore in greater depth a limited number of topics and acquire important skills in interpreting the scientific literature. Marks will be awarded for class participation. Participation in each of the 12 discussion sessions will be worth 2% of the final mark, with 1% for participating once, and another 1% for participating two or more times. Mid-term and final exams will also be based on pre-assigned research papers.

Course Evaluation:

Your grade in this course will be based on class participation; a two-hour mid-term test; a three-hour exam to be held during the final examination period; and an assignment. The grade distribution will be as follows:

Class participation	25%
Mid-term test	25% (5% based on lectures; 20% based on two assigned papers)
Essay assignment	15%
Final examination	35% (7% based on lectures; 28% based on two assigned papers)

The mid-term test will be held on Friday, October 24 from 5:00 - 7:00 P.M. in the Bahen Centre (BA), Room 2165 (40 St. George Street). It will be based on two pre-assigned papers that can be consulted during the test. The final examination will last 3 hours and also be based on two pre-assigned papers that can be consulted during the exam. The pre-assigned papers will be distributed a week ahead of the exams.

The essay assignment will require that you read several scientific papers and discuss the ideas presented in these papers. The essay assignment topics will be revealed at the end of October and must be submitted no later than Tuesday, Dec. 2, at the class that day. There will be a penalty of 1 mark per day for lateness.

COURSE OUTLINE

Sept. 3, 8*	General transcription factors, initiation complex assembly, Mediator, TFs	JG (+EC)
Sept. 10, 15*	Chromatin and transcription	EC (+JG)
Sept. 17, 22*	Histone and DNA modifications for activation and repression	EC (+MM)
Sept. 24, 29*	Promoter escape, elongation of the transcript, polII CTD	JG (+MM)
Oct. 1, 6*	Elongation factors and effects of chromatin on elongation	EC (+JG)
Oct. 8, 15*	Enhancers, transcription factors, and co-activators	EC (+MM)
Oct. 20, 22*	Heat shock regulation, HIV Tat, and poised/paused RNA polymerase II	JG (+MM)
Nov. 3, 5*	Regulatory roles for non-coding transcripts: RNAi and lncRNA	MM (+EC)
Nov. 10, 12*	Regulation of RNA turnover and translation	MM (+EC)
Nov. 17, 19*	Regulatory roles of mRNA splicing and modifications	MM (+JG)
Nov. 24, 26*	Transcriptional termination and 3' end formation	MM (+JG)
Dec. 1, 2*	Single cell experiments: stochastic effects and developmental regulation	JG (+EC)

*Class discussion days. Class discussions will be moderated and evaluated by Drs. Meneghini, Greenblatt, and Campos. No classes will be held on Oct. 13 (Thanksgiving) or Oct. 27 and 29 (Reading week).