



# MBG\*3040 Molecular Biology of the Gene

Fall 2017

Sections(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 1.00 - September 06, 2017

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## 1 Course Details

### 1.1 Calendar Description

In this course, the structure, expression, control and modification of eukaryotic genes will be discussed with an emphasis on the underlying mechanisms and structure/function relationships. Many topics covered in introductory courses are included but discussed at a more advanced level. Students will have the opportunity to learn current genetic concepts and principles through lectures, as well as the application of this knowledge in the real world through primary literature reading and group research projects.

**Pre-Requisite(s):** MCB\*2050

**Restriction(s):** MBG\*4080

### 1.2 Course Description

This is an advanced genetics course focused on eukaryotic gene expression and regulation. The structure, expression, control and modification of genes will be discussed with an emphasis on the underlying mechanisms and structure/function relationships. Many topics covered in introductory courses are included but discussed at a much more advanced level. Students will have the opportunity to learn current genetic concepts and principles through lectures, as well as application of this knowledge in the real world through primary literature reading and group research projects.

### 1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

### 1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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## 2 Instructional Support

### 2.1 Instructor(s)

**Ray Lu**

Email: rlu@uoguelph.ca  
Telephone: +1-519-824-4120 x56247  
Office: SSC 3443

## 2.2 Teaching Assistant(s)

Name	Details
Sonia Evagelou	sevagelo@uoguelph.ca

## 3 Learning Resources

### 3.1 Required Resources(s)

#### **Molecular Biology (Textbook)**

**Molecular Biology.** R.F. Weaver, McGraw-Hill Higher Education, 5th (2012) edition.

On reserve in the Library.

#### **Courselink (Website)**

<https://courselink.uoguelph.ca>

This course will make use of the University of Guelph's course website Courselink.

Consequently, you are responsible for all information posted on the Courselink page for MBG\*3040. Please check it regularly.

### 3.2 Recommended Resources(s)

#### **Lewin's Genes (Textbook)**

**Lewin's Genes XI** (2014), Krebs, Goldstein and Kilpatrick, Jones & Bartlett Learning.

On reserve at the Library.

#### **Molecular Biology of the Gene (Textbook)**

**Molecular Biology of the Gene**, J.D. Watson, T.A. Baker, S.P. Bell, A. Gann, M. Levine, R. Losick, 7<sup>th</sup> (2014) Edition, CSH Press.

On reserve in the Library.

#### **Undergraduate Calendar (Website)**

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>

The Undergraduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs.

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Describe molecular structure and properties of genes and chromatin
  2. Recognize and describe complex eukaryotic gene regulation at the transcriptional, post-transcriptional, translational and post-translational levels
  3. Classify and explain macromolecular interactions involved in specific gene regulatory mechanisms
  4. Identify molecular biology techniques appropriate for particular gene regulation problems, and analyze and interpret experimental results
  5. Use online tools to research a particular topic, and critically review primary research articles in molecular genetics in working groups and individually
  6. Communicate science (in both written and oral forms) effectively
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## 5 Teaching and Learning Activities

### 5.1 Course Format

#### **Lectures**

Two 80-minute lectures per week;

#### **Oral Presentation**

Students will form small groups and will be given a primary research article focused on a particular mode of gene regulation. Each group is required to research the background information about the topic, and critically read the paper and analyze the experimental data therein.

#### **Essay Assignment**

Each student group is also required to write a critique of the research paper that they are assigned to.

### 5.2 Tentative Lecture Topics & Schedule

TOPICS	Lec#	WEEK
Introduction	1	1
1. Eukaryotic Transcription and Its Regulation		
1.1. Eukaryotic RNA polymerases and promoters	2	2
1.2. General transcription factors	3	2
1.3. Transcription activators and repressors	4-5	3
<b>In-class tutorial on how to prepare for a presentation and write an essay, Tue Sept 26</b>		4
1.4. Chromatin structure and epigenetics	6-7	4-5
<b>Quiz 1, in class on Thu Oct 5 (covers Lectures 1-7)</b>		5
1.5. RNA splicing and processing	8-9	6-7
2. Post-Transcriptional Events and Regulation		
2.1. mRNA stability and localization	10-11	7-8
2.2. RNA interference	11-12	8-9
3. Translation and Its Regulation		
3.1. Initiation of Translation in Eukaryotes	13	9
3.2. Mechanisms of Eukaryotic Initiation Control	14	10
<b>Quiz 2, in class on Thu Nov 9 (covers Week 8-14)</b>		10
<b>Group presentation 1; Tue Nov 14</b>		10

<b>Group presentation 2;</b> Tue Nov 14	10
<b>Group presentation 3;</b> Thu Nov 16	11
<b>Group presentation 4;</b> Thu Nov 16	11
<b>Group presentation 5;</b> Tue Nov 21	11
<b>Group presentation 6;</b> Tue Nov 21	11
<b>Group presentation 7;</b> Thu Nov 23	12
<b>Group presentation 8;</b> Thu Nov 23	12
<b>Flexible Time as needed (Reviews, Alternative presentation date etc)</b>	
<b>Final Exam, Mon Dec 11, 11:30AM-1:30PM (comprehensive)</b>	

### 5.3 Key Dates

**Tue Sept 26:** In-class tutorial;

**Thu Oct 5:** 1<sup>st</sup> quiz;

**Fri Nov 3:** 40th class day -- Last day to drop the course;

**Thu Nov 9:** 2<sup>nd</sup> quiz;

**Thu Nov 16:** Due date for the essay;

**Mon Dec 11:** Final Exam;

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## 6 Assessments

## 6.1 Marking Schemes & Distributions

### Oral Presentation OR Research Proposal

Students will form groups of 4-5. Approximately half of the class will get to choose the oral presentation format, while the other half will write an essay or review. Dr. Lu is available **throughout** this process, to give you guidance and help in gathering and critically reading research material, organizing, planning and finalizing your presentation/essay. Detailed instructions on the oral presentation and the written essay will be given separately on CourseLink.

Oral presentation schedules are given in the Tentative Lecture Topics and Schedule (above). A primary research paper on a particular gene regulation needs to be chosen at least four weeks ahead of the presentation date.

Written essays will use the same topics. The group essay should be completed using Google Docs and shared with Dr. Lu at uofgmbg@gmail.com. The essay is due at **noon, Thursday Nov 16**, to a designated group Dropbox folder on CourseLink. Each group needs only send one copy of your essay.

The corresponding presentation and essay groups are required to write a critique of the other group's work. The presentation critique is due at **noon, one week after the presentation** and the essay critique is due at **noon, Thursday Nov 23**, to a designated Dropbox on CourseLink. **Each student needs to submit his/her own critique.**

### Assessment

Form of Assessment	Weight of Assessment (% of final)	Course Content /Activity	Learning Outcome (see above)
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Quiz 1		15%	Lectures 1-5	1-4
Quiz 2		15%	Lectures 6-11;	1-4
	Oral presentation	30%	Non-lecture	1-6
Option 1	2-page critique of peer group essay	5%	Non-lecture	5-6
Option 2	Written essay	30%	Non-lecture	1-6
	2-page reading notes and critique of the peer group presentation	5%	Non-lecture	5-6

The two quizzes and the final exams will be short-answer questions that often require synthesis of ideas and facts from various parts of the course. The two quizzes are not accumulative, i.e. Quiz #2 will not cover the material that is Quiz #1. The Final Exam will be comprehensive and covers the entire course material, including students' presentations.

## 7 Course Statements

### 7.1 Missing Quizzes

If you miss one quiz and academic consideration is granted, your other quiz will be re-weighted to 30%

If you miss both quizzes and academic consideration is granted, your final exam will be re-weighted to 60%.

### 7.2 Grading

Essays are due by Noon on the due date, via submission to designated folders on the CourseLink web sites. Late essays submitted on the same due date will result in 5% penalty, and 5% penalty for each additional day.

Students who wish to have their midterm exams re-graded must submit their exams to the instructor within 5 class days of the return of the midterm exam. The entire midterm exam will be re-graded so the mark may go up, down or remain unchanged.

## 8 Department of Molecular and Cellular Biology

### Statements

#### 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

#### 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.  
<http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

#### 8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to



stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

## 9 University Statements

### 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

### 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

### 9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

### 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

### 9.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

## 9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 9.8 Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

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