

**MBG*4080
Molecular Genetics
Fall 2015**

**Department of Molecular and Cellular Biology
University of Guelph**

COURSE OBJECTIVES

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.

COURSE PERSONNEL

Instructor: Dr. Ray Lu
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Ext. 56247
Email: rlu@uoguelph.ca

Teaching Assistant: Samantha Watt
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(Do not contact your TA outside the designated hours unless you are given the permission to do so)

COURSE SCHEDULE

Tuesdays and Thursdays: 1:00pm – 2:20pm; MACK 029

Instructor's Office Hours: Tue and Thu, 2:30pm-4:30pm, SSC 3443

LEARNING OUTCOMES

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

1. Recognize and describe complex eukaryotic gene regulation that exists at multiple levels;
2. Classify and explain macromolecular interactions involved in specific gene regulatory mechanisms;
3. Employ appropriate molecular biology techniques for particular gene regulation problems, to test hypotheses and/or provide answers;
4. Use online tools to research a particular topic, and read primary research articles in molecular genetics critically (including the ability to analyze and interpret experimental results);
5. Write a scientific review and a research proposal in molecular genetics, in which students succinctly summarize current findings on a particular topic, identify unsolved biological problems of interest, propose a hypothesis and design experimental strategies to test the hypothesis;

COURSE RESOURCES

Textbook (required):

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

Textbooks on Course Reserves in the Library:

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

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

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

Courselink:

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*4080. Please check it regularly.

Undergraduate Calendar:

The Undergraduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs. It can be found at: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>.

COURSE FORMAT

Lectures

Two lectures per week: Tuesdays and Thursdays from 1:00 - 2:20 PM, MCKN, Room 029.

Essay Assignments

In addition to the two lecture sessions every week, this course also has two essay assignments: the first essay is a review on a gene of interest; and the second one is a research proposal on the same gene, which is built on the first review. Students will write these essays in groups of two. For the research proposal, students are asked to identify a biological problem that has no clear answer in the current literature, propose a hypothesis and design three sets of experiments to test it.

Tentative Lecture Topics and Schedule

TOPICS	WEEK
Discussion of a Primary Research Article	1-2
1. Eukaryotic Transcription and Its Regulation	
1.1. Eukaryotic RNA polymerases and promoters	3
1.2. General transcription factors	4
1.3. Transcription activators and repressors	5
1.4. Chromatin structure and epigenetics	6-7
Midterm Exam: In-class on Tue Oct. 27 (covers lectures of Week 1-7)	8
1.5. RNA splicing and processing	8-9
2. Post-Transcriptional Events and Regulation	9-10
2.1. mRNA stability and localization	
2.2. RNA interference	
3. Translation and Its Regulation	11-12
3.1. Initiation of Translation in Eukaryotes	
3.2. Mechanisms of Eukaryotic Initiation Control	
4. Post-translational Control (Brief Discussion)	12
4.1. Protein Modification, Folding, Stability and Localization	
Final Exam: Thu Dec. 17, 7 PM – 9 PM (comprehensive)	

Key Dates

Sept. 22: In-class tutorial on how to research literature and write the first essay;
Sept. 24: Submission of gene/topic of interest for the first essay;
Oct. 20: Due date for the first essay;

Oct. 20: In-class tutorial on how to write a research proposal for the second essay;
 Oct. 27: In-class Midterm Exam;
 Nov. 6: 40th class day -- Last day to drop the course;
 Nov. 26: Due date for the second essay;
 Dec. 17: Final Exam (7:00 PM - 9:00 PM);

METHODS OF ASSESSMENT

Assessment				
Form of Assessment	Weight of Assessment (% of final)	Due Date of Assessment	Course Content /Activity	Learning Outcome (see above)
Essay 1	25%	Noon on Tue Oct. 20	Lectures Week 1 - 6; Assigned readings	1, 2 and 4
Midterm Exam	20%	Tue Oct. 27 (in class)	Lectures Week 1 - 7	1, 2 and 3
Essay 2	25%	Noon on Thu Nov. 26	Lectures Week 1-11; Assigned readings	1-5
Final Exam	30%	Thu Dec. 17, (19:00 – 21:00)	Lectures Week 1 -12	1, 2 and 3

Each essay will be 10-12 typed pages (double spaced 12 pt) in length, excluding References and Figures. Credit will be given for both factual content and students' own academic input.

The Midterm Exam will be essay-type questions that often require a synthesis of ideas and facts from various parts of the course. The Final Exam will be comprehensive and covers the entire course material.

COURSE AND UNIVERSITY POLICIES

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. See the

undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

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: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

E-mail Communication

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

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date, please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

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.

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.

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:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

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.

CAMPUS RESOURCES

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

- make an appointment with a program counsellor in your degree program.
<http://www.bsc.uoguelph.ca/index.shtml> or
<https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

- 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/>

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.uoquelpg.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoquelpg.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.uoquelpg.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

- The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoquelpg.ca/csd/>