



MCB*2050 Molecular Biology of the Cell

01

Fall 2022

Section(s): 01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 2.00 - September 09, 2022

1 Course Details

1.1 Calendar Description

This course will develop an understanding of the key concepts of the molecular biology of the cell, integrating principles of cell structure and function with the underlying molecular mechanism(s). Discussions will focus on aspects of gene regulation, genomics, cell cycle control, protein synthesis, intracellular protein trafficking and protein degradation in eukaryotic cells. Many of these concepts will be discussed in the context of how defects in cellular processes give rise to disease.

Pre-Requisites: BIOC*2580, MBG*2040

1.2 Course Description

Course Objectives:

This course builds on the fundamental concepts of genes, genetics and molecular biology that are covered in MBG*2040, and continues to develop a deeper understanding of the molecular biology of the cell by integrating principles of cell structure and function with the underlying molecular mechanisms. Discussions will focus on aspects of gene regulation, cell cycle control, protein synthesis, intracellular protein trafficking and protein degradation in eukaryotic cells and techniques used to study them. Many of these concepts will be discussed in the context of diseases that are caused by defects in these cellular processes. (0.5 credits, Prerequisites: BIOC*2580, MBG*2040)

1.3 Timetable

Lectures: M/W/F 1:30 pm - 2:20pm in Albert A. Thornbrough building Room 1200.

Lectures representing the basic course material are further clarified and amplified by

textbook, tutorial and seminar material. Students are responsible for all content covered in lectures and tutorials.

Seminar component of Tutorials:

Weekly synchronous seminars are held on Tuesdays beginning on Sept. 27th. Students must attend the seminar section in which they are registered. See WebAdvisor for your Scheduled Seminar time and location.

1.4 Final Exam

Thursday Dec15 at 11.30 am

Location TBA: Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor: Dr. Muhammad Zaman
Email: mzaman02@uoguelph.ca
Office: SSC 4441
Office Hours: **In person office hours: Tuesdays and Thursdays 12.00 pm - 2.00pm.**

Attend office hours for questions regarding Lectures 1-18.

Instructor: Dr. Robert Mullen
Email: rtmullen@uoguelph.ca
Telephone: 519-824-4120 x 56470
Office Hours: By Appointment

Attend office hours for questions regarding Lectures 19-36.

Course Co-ordinator: Dr. Satinder Gidda
Email: sgidda@uoguelph.ca
Telephone: 519-824-4120 ex. 53795
Office: Room SSC 3520
Office Hours: **In-person Office Hours: SSC 3520 - Thurs. 11 am - 12 pm, beginning Sept 15th**

Attend these office hours for questions regarding the Tutorial material, seminars or quizzes. Questions or concerns of a

private nature should be emailed in order to protect student privacy.

2.2 Teaching Assistants

The tutorial instructors are graduate students from the Department of Molecular and Cellular Biology. Please do not contact them outside of your tutorial hours unless they have given you permission to do so.

3 Learning Resources

3.1 Required Resources

Introduction to Molecular Biology, Cell Biology and Genetics (Textbook)

Department of MCB, University of Guelph Custom Text for BIOL 1090/MBG 2040/MCB 2050 - MacMillan. 2021. MCB*2050 uses selected chapters from the Molecular Cell Biology, Lodish portion of the custom textbook package. This textbook package can be purchased at the U of G Bookstore or Co-op Bookstore. It includes a hard copy of the custom text as well as 4 years of access to the digital platform ACHIEVE which includes the e-book and additional learning resources. A digital only version of this package is also available. **All students who took BIOL 1090 in F21 or W22 will have already purchased this textbook and will have access to ACHIEVE.** If you purchased the textbook before F21, please check the course CourseLink page for a new access code and instructions to set up your digital ACHIEVE access for both the text and the digital resources required for MCB*2050. Questions regarding the MCB 2050 textbook package can be directed to the course coordinator Satinder Gidda at sgidda@uoguelph.ca.

CourseLink (Website)

<https://courselink.uoguelph.ca>

There is a CourseLink web site set up for this course. You can access this CourseLink from <http://courselink.uoguelph.ca>. Your username is your Central Login ID and your password is your uoguelph email password. All lectures, tutorial material and course assessments can be found on the MCB*2050 CourseLink site. Please login regularly to receive course announcements and updates.

The online forums are meant for discussions concerning course material only. Non-course related postings are not permitted. We always appreciate your comments to improve our teaching; however, suggestions or concerns about the course should be brought up to the instructors directly, but not to be posted onto the forum. All postings deemed inappropriate will be removed.

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Describe a gene and explain the key molecular mechanisms of eukaryotic gene regulation and expression at various levels from DNA to chromosomes and final products.
 2. Apply genetic and molecular principles to analyzing and interpreting experimental data.
 3. Explain the conceptual and technical aspects of various molecular techniques and bioinformatics and be able to apply them to analysis of genes, genomes and gene products.
 4. Describe, with examples, the molecular basis of select genetic diseases, how to map them to the genome and how to apply molecular techniques for their diagnoses and perhaps treatment.
 5. Describe the basis of biotechnology as applied to microbes, animals and plants.
 6. Explain the genetic/molecular principles underlying cell cycle control and cancer.
 7. Explain the relationship between structure and function of the endomembrane system and nucleus.
 8. Explain the synthesis, quality control and intracellular trafficking of biological molecules to specific subcellular compartments.
 9. Synthesize ideas and communicate concepts in cellular and molecular biology using written communication skills in written assignments and examinations.
 10. Manage time effectively and follow instructions to meet deadlines for course requirements.
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5 Teaching and Learning Activities

5.1 Lecture

Topics:

Tentative Lecture Schedule

Lectures

Lodish

Topic

Textbook Chapter

1-4	Overview gene expression, gene regulation in eukaryotes.	8
5-7	Gene repression and activation	8, 9
8-9	RNA processing	8,9
10-12	Signal Transduction	15,16
13-18	Cell cycle, Cell Death and Cancer	19,22,25
19-22	Nucleus and nuclear transport	13,19
23-24	Microscopy	4
25-27	Endomembrane system - Overview, ER and protein synthesis	7,13,14
28,29	Vesicular trafficking – ER to Golgi	13,14
30,31	Biosynthetic and endocytic pathways - Endosomes and lysosomes	14
32-36	Mitochondria, chloroplasts and peroxisomes	13

*Lecture numbers are approximate and are provided as a guide to the order of materials covered in lectures. Some topics may be discussed over more lecture slots and some less

than indicated. Lectures are posted on the M/W/F schedule and can be viewed at any time after they are posted.

5.2 Seminar

Topics: **Tutorial Details and Schedule**

Tutorial Material and Quizzes: There are seven tutorials held throughout the semester; each include a graded online quiz and in person Seminar (see schedule below).

Tutorial Quizzes 1 - 7: Students must complete the tutorial material in order to gain access to the Tutorial Quiz. The tutorial material contains online readings, videos and activities designed to teach the techniques used to study molecular and cellular biology (Learning Outcomes 2,3). The online Tutorial material provides a brief review of the current lecture topic AND focus specifically on the techniques used to study this content. The quizzes, at the end of each of these tutorials assess students on both the current lecture topic and the techniques covered in tutorial. Each Tutorial Quiz is worth 2% of the final grade. The best 6 of 7 quizzes are kept, comprising 12% of the final grade. Quizzes close before the beginning of the corresponding seminar. See the schedule for a complete list of all tutorial quiz due dates.

Optional online Quizzes: Recently some material on basic techniques of molecular biology was moved from MCB*2050 to MBG*2040. If you have NOT taken MBG*2040 in F21/W22 semester or if you are uncertain about your grip on these techniques please visit the two OPTIONAL TUTORIALS in CourseLink in the 'Tutorials' module. WE ARE NOT GOING TO TEST YOU ON THIS MATERIAL, however it is assumed that you are familiar with it when we present higher order techniques during the lectures and the other tutorials.

Tutorial Seminars 1-7: The in-person seminar focuses on applying the techniques covered in tutorial to scientific questions pertaining to the lectures. See below for a detailed description of the seminars. Seminars led by graduate Teaching Assistants (TAs) from the department of MCB. Seminars are in person - please ensure you know the date, time and location for your section's seminar. In these seminars students will work with their classmates to apply the techniques covered in tutorial to the lecture content by completing an application assignment. These assignments are posted the week before each seminar

on CourseLink, under Content - Tutorials/Seminars. The application assignments consist of 3 - 4 problem solving and data analysis questions and are meant to challenge students as they apply their knowledge to molecular problems. For each assignment the first 2-3 questions are completed with the assistance of the TA. The final question is completed during the seminar, without TA assistance, and is graded. Application assignments are due at the end of seminar and should be submitted in the Dropbox, within 15 min of the end of the seminar. Dropbox is found in the MCB2050 CourseLink navigation bar. Students must attend the seminar for which they are registered in order to receive the seminar assignment mark. Each assignment is worth 1.5% of the final mark. The best 6 of 7 grades are kept comprising 9% of the final grade.

Students should conduct themselves appropriately during seminar. Inappropriate behavior may result in removal from the seminar. Please see the University policy on Academic Conduct.

NOTE: Posting any seminar or quiz questions on any social media or course material sharing websites violates University of Guelph copyright and Academic Integrity policies and will be considered academic misconduct. Please refer to the section on Academic Integrity below for more information regarding expectations and penalties.

Tutorial	Seminar Date	Quiz Close Date (Tues. at 11:00 am)
1: Gene expression	Sept. 27th	Sept. 27th
2: Quantifying RNA	Oct. 4th	Oct. 4th
3: Signal Transduction	Oct. 18th	Oct. 18th
4: Cell cycle and Apoptosis	Oct. 25th	Oct. 25th
5: Nucleus and Nuclear Transport	Nov. 8th	Nov. 8th
6: ER and Golgi compartments	Nov. 15th	Nov 15th

7: Endocytic Pathways and
Lysosomes

Nov. 22nd

Nov. 22nd

5.3 Notes

Any dispute regarding your Tutorial Quiz or Seminar Assignment marks has to be raised with the course coordinator within one week after the marks are posted.

5.4 Recordings

Electronic recording or photographs of lectures and tutorials is expressly forbidden without prior consent of the instructor. When recordings are permitted, they are solely for the use of the authorized students and may not be reproduced, or transmitted to others, without the express written consent of the instructor. You should not be using electronic devices, like cell phones and ipads during lecture. Not only is it distracting you from the lecture, but also distracting to those around you. If you have to use a laptop, it should be for only lecture related material (e.g. taking notes)

6 Assessments

6.1 Assessment Details

Tutorial Quizzes (12%)

Date: Open for one week each

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Best 6 of 7 (2% each)

Seminar - Application Assignments (9%)

Date: In scheduled tutorials

Learning Outcome: 2, 3, 5, 9, 10
Best 6 out of 7 (1.5% each)

Midterm Examination (39%)

Date: Sat, Oct 29, 3:30 PM - 5:00 PM, MACN 105 (MACNAUGHTON BUILDING)

Learning Outcome: 1, 2, 3, 4, 5, 6

The midterm examination will be held on, Saturday October 29th, from 3.30pm to 5.00pm.

The midterm examination is compulsory and accounts for 39% of your final grade.

Alternate times will be set for midterm exams only if there is a direct conflict with another course (has been reported to the instructor by Friday Sep. 30th) or if there is a Gryphon Varsity event (has to be confirmed by the team coach), on the day of the scheduled exam.

Only one alternative date will be provided.

If a student does not write the midterm they will receive a grade of 0% unless proper documentation is presented to the course instructors no later than three days after the scheduled exam. Students who are unable to write the midterm exam and provide proper documentation, will be required to write a separate final exam with 50% content from the first half of the course and 50% content from second half of the course.

Final Exam (40%)

Date: Thu, Dec 15, 11:30 AM, TBD

Learning Outcome: 1, 2, 3, 4, 5, 6, 7, 8, 9

The final exam is a compulsory examination and will be covering content from the second half of the course.

Students who are unable to write the midterm exam will have to write a final exam with 50% content from the first half of the course and 50% from second half of the course. The weight of the midterm will be transferred to the final exam.

7 Course Statements

7.1 Policy for Re-grading of Midterm Exams

Students who wish to have their midterm exam re-graded must submit a request to the instructor within 1 week after writing 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.selfregulationskills.ca/>

8.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar. (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

8.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course

format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

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 grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

9.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, 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 that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

9.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

9.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.
