MBG*3350 Laboratory Methods in Molecular Biology

Winter 2021
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.75
Version 2.00 - January 19, 2021

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1 Course Details

1.1 Calendar Description

This course involves laboratory based instruction in the basic methodologies of Molecular Biology. Students will have the opportunity to develop technical skills and practical knowledge sufficient to perform basic procedures independently, and to diagnose and analyze experimental results obtained with these techniques.

Pre-Requisites:	BIOC*2580, MCB*2050
Restrictions:	Registration in BSC.BIOC (major or minor), BIOC:C , BTOX, BTOX:C, BPCH, BPCH:C, MICR(major or minor), MICR:C , MBG (major or minor), PBTC, PLSC (major or minor), TOX, TOX:C

1.2 Course Description

These are difficult and unusual times for all students. Please contact the course instructor (Steffen Graether - graether@uoguelph.ca) regarding any issues (technical, accessibility, personal/compassion) you are having with the course.

1.3 Timetable

Laboratory:

Either Monday & Wednesday **or** Tuesday & Thursday 1:30-5:20 pm

Laboratory will be in a virtual/online format

Videos of all experiments will be posted on Courselink, as will protocols, data files, and supporting documentation. Synchronous discussion and Q/A sessions with your TA will be online during a portion of the scheduled laboratory hours.

Lecture: Friday 2:30-5:20 pm

Lectures will be in an online format delivered through Zoom (see links on Courselink under Content/Zoom Lectures). Captured lectures will be available several hours after the live lectures on Courselink.

1.4 Final Exam

There is no final exam for this course. There are two term exams scheduled for Feb. 12 and Mar. 26. The final exam date listed on Webadvisor for April 26 is for contingency planning only.

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2 Instructional Support

Virtual office hours for TAs will be posted in courselink.

2.1 Instructional Support Team

Instructor:	Steffen Graether
Email:	graether@uoguelph.ca
Office Hours:	Tuesday, 10:30 am - noon Additional office hours will be posted before term exams. Other appointment times can be scheduled by email.
Lab Co-ordinator:	Elspeth Smith
Email:	elspeths@uoguelph.ca
Telephone:	+1-519-824-4120 x56583
Office:	SSC3505
Office Hours:	Fridays 11:30am - 12:30pm. Attend these office hours to ask questions about the lab component of this course.

2.2 Online Behaviour

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students
- Using obscene or offensive language online
- Copying or presenting someone else's work as your own
- Adapting information from the Internet without using proper citations or

references
- Buying or selling term papers or assignments
- Posting or selling course materials to course notes websites
- Having someone else complete your quiz or completing a quiz for/with another student
- Stating false claims about lost quiz answers or other assignment submissions
- Threatening or harassing a student or instructor online
- Discriminating against fellow students, instructors and/or TAs
- Using the course website to promote profit-driven products or services
- Attempting to compromise the security or functionality of the learning management system

- Sharing your user name and password
- Recording lectures without the permission of the instructor

2.3 Recording of Lecture Materials

By enrolling in a course, unless explicitly stated and brought forward to their instructor, it is assumed that students agree to the possibility of being recorded during lecture, seminar or other “live” course activities, whether delivery is in-class or online/remote.

If a student prefers not to be distinguishable during a recording, they may:

1. Turn off their camera
2. Mute their microphone
3. Edit their name (e.g., initials only) upon entry to each session

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3 Learning Resources

3.1 Required Resources

Computer & Internet (Equipment)

Lectures will be delivered synchronously (live by streaming) and asynchronously (available for streaming after the lecture). The Zoom app will be used.

Students must create a Zoom account using their UoG email address. Failure to do so may prevent you from joining the class synchronously.

The two tests will be administered using the Respondus Lockdown Browser, which requires a video device.

Students registered with the SAS, or students with constrained internet bandwidth or computer access, are requested to contact the instructor or through their SAS advisor for accommodations.

Courselink (Website)

https://courselink.uoguelph.ca

This course will make use of the University of Guelph's course website on D2L (via Courselink) and email. Consequently, you are responsible for all information posted on the Courselink page for MBG*3350 and email. Please check them regularly.

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4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Explain the fundamental principles of practical molecular biology
2. Recognize and interpret experimental results
3. Implement the theoretical principles and apply them in the execution of lab experiments
4. Plan, design, monitor, troubleshoot and optimize experiments
5. Use online tools to research a particular topic, and read primary research articles in molecular genetics
6. Identify skills gained in this course and describe how those skills can be applied in the workforce

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5 Teaching and Learning Activities

5.1 Lecture

One lecture per week at Friday 2:30-5:20 pm, which will conducted through Zoom. The class will typically consist of 1.5 hours of lecture followed by 0.5 hours of tutorial/discussion.

5.2 Laboratory

Two lab sessions per week: Monday/Wednesday or Tuesday/Thursday 1:30-5:20 pm

Laboratory will be in a virtual/online format

There are eight weeks of labs throughout the semester broken up into 4 lab modules (2 weeks each - Week A/Week B). Each week of labs has two lab days, Mon./Wed. (sections

0101 and 0102) or Tues./Thur. (sections 0103 and 0104).

The first portion of each lab day consists of online independent material for students to review including, "How to" videos, experimental protocols, and data files. This material will be posted the Friday evening before each module begins. The second portion of each lab day consists of a synchronous lab tutorial held via Zoom and led by course TAs. In these lab tutorials students will go over the techniques and concepts covered in the first portion of the lab, as well as practice questions and case studies designed to prepare students for the Lab Module Assignments. Material will be available online at the beginning of each module. The lab tutorials are scheduled during a portion of the schedule laboratory hours. Marks will be awarded for participation in discussions and polls during tutorials (3%).

Lab tutorials are mandatory. **You must attend 10 of the 16 lab tutorials to pass this course.** Lab tutorial exemptions will be given to those who are unable to attend due to a major time difference (if the session takes place between 12am - 6am in your time zone), major unresolvable technical issues or another valid reason. In this case students will receive recordings of the tutorials and the participation mark will be based on discussion board contributions. Please email the lab coordinator Elspeth Smith elspeths@uoguelph.ca for a lab exemption. Please note students can miss up to 2 lab tutorials for any reason (exemption is not required) without penalty or loss of participation marks.

Each lab module has an associated Lab Quiz. These quizzes will be available for 24hr on the Friday of Week A of each lab module. Each quiz is worth 2% of the final grade.

Each lab module has an associated Lab Assignment. These are typically due one week after the module is over (some exceptions apply). Each Lab assignment is worth 6% of the final grade. See the course schedule below or the virtual Course Schedule on Courselink for a complete list of all course due dates.

5.3 Lecture/Lab Topics and Schedule

Week/Date	Laboratory schedule		Lecture Topic
	Day 1	Day 2	
Week 1 Jan. 11 - 15 Introduction	Orientation and Introduction video Benchling sign-up instructions		Lecture 0 : Course introduction (Pre-recorded online) Lecture 1 (Jan. 15): Plasmid isolation, DNA analysis and Gene cloning

Week 2 **Jan. 18 - 22** **Module 1A**	Plasmid mini-prep DNA quantitation Restriction enzyme digests	How to pour an agarose gel How to run and visualize DNA on an agarose gel	Lecture 2 (Jan. 22): ***E. coli*** as a heterologous host for gene cloning • **Module Quiz 1**
Week 3 Jan. 25 - 29 **Module 1B**	Introduce Benchling What are plasmids? Applications Important features Copy number, etc.	Analyze data, label a gel, how to write a figure legend, virtual digests using Benchling	Lecture 3 (Jan. 29): PCR
Week 4 Feb. 1 - 5 **Module 2A**	PCR for molecular cloning Cleaning a PCR product DNA ligation	DNA transformation, selection of recombinant bacteria (colony PCR) qPCR • ***Assignment 1 due 5 pm***	Lecture 4 (Feb. 5): qRTPCR • **Module Quiz 2**
Week 5 Feb. 8 - 12 **Module 2B**	Primer design principles Design primers, virtual PCR using Benchling PCR result troubleshooting	Clone PCR product into appropriate vector (Benchling) using appropriate restriction enzymes, antibiotics qPCR data analysis	Lecture 5 (Feb. 12): **Term Exam #1** on Lectures 1-4 and Labs weeks 1-4.

	Import DNA sequence into Benchling		
Reading Week Feb. 15-19	No Lab	No Lab	
Week 6 Feb. 22 - 26	No Lab	No Lab • ***Assignment 2 due 5 pm***	Lecture 6 (Feb. 26): Recombinant protein expression and purification
Week 7 Mar. 1 -5 **Module 3A**	Protein purification: start cultures, induce, harvest and lyse, affinity purification of GFP protein	SDS-PAGE: how to pour a gel How to load and run protein on SDS-PAGE Visualize protein with Coomassie Western blot	Lecture 7 (Mar. 5): Protein quantification and analysis by SDS-PAGE • **Module Quiz 3**
Week 8 Mar. 8 -12 **Module 3B**	protein purification strategies. Discuss C-terminal vs N-terminal tags	Analyze data Examine Methods sections of Journal articles	Lecture 8 (Mar. 12): Science Beyond the Lab (self-reflection)
Week 9	*Online tools*	*Online tools*	Lecture 9 (Mar. 19): Western, Northern and

Mar. 15 - 19 **Module 4A**	GenBank NCBI-blast	multiple sequence alignments • ***Assignment 3 due 5pm***	Southern blotting • **Module Quiz 4**
Week 10 Mar. 22 - 26 **Module 4B**	*Online tools* Conserved regions in homologous proteins	*Online tools* Protein structure predictions	Lecture 10 (Mar. 26): **Term exam #2** on all lectures and Labs 1-9.
Week 11 Mar. 29 - Apr.1	No Lab	No Lab ***Assignment 4 due 5pm***	Apr. 2 - Good Friday (no lecture) **Self Reflection Assignment due** 5 **pm** on Apr. 1 (4%).
Week 12 Apr. 5 - 12	No Lab	No Lab ***Culminating report due 5pm***	Lecture 11 (Apr. 9): Advanced Protein Bioinformatics Lecture 12 (Apr. 12): No Lecture

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6 Assessments

6.1 Marking Schemes & Distributions

Term Exams

Term Exams 1 and 2 will be held during regular lecture time online on Courselink. Respondus lockdown and monitor are required. Students are advised to access the practice test on courselink in advance of the exam dates to ensure that Respondus is working on their computer systems.

If you fail to write Term Exam 1, a grade of 0% will be assigned unless an acceptable cause (such as sickness or family emergency) is documented. In the situation where academic

consideration is given, Term Exam 2 will be adjusted to 46%. For missed Term Exam 2, an Incomplete Grade will be submitted with a recommendation of 0% unless academic consideration is granted for a deferred exam.

Respondus will be used for both Term Exams and requires a microphone and camera. A practice test will be posted so that students can check that the program works correctly on their computer.

Assigments

Assignments and reports must be typed, double-spaced, 12-point font. All assignments are due at 5 pm on their noted due date. Assignments must be uploaded to the relevant folder in the dropbox of courselink.

Late assignments will be accepted without penalty only for medical or compassionate reasons with documentation. Late assignments without valid reasons will be penalized 10% per day up to 50%. A grade of zero is assigned after 5 days late.

ALL lab assignments and reports are an important part of the course. Missing two or more of these assessment will lead to an “incomplete” for the course at the end of the semester.

Module Quizzes

The module quizzes are held Fridays of week 1 for each Module (check “Lecture/Lab Topics and Schedule” in this course outline for dates. These quizzes are housed in Courselink. You can complete each Quiz anytime during the scheduled date from 12 am to 11.59 pm. There will be no make up quiz.

Self reflection

Details on how to complete the self reflection assignment will be posted on Courselink.

Name	Scheme A (%)
Term Exam 1	21
Term Exam 2	25
Self-reflection essay	4
Lab Activities (50% Total)	0
Module Quizzes (4 x 2% each)	8

Name	Scheme A (%)
Module Assignments (4 x 6% each)	24
Cumulative Assignment	15
Discussion Participation	3
Total	100

7 Course Statements

7.1 Grading

All assignments are due at 12:00pm (noon).

When assignment grades are released, take your time to review the assignment and the comments that were made. After 24h you may contact the Lab Coordinator if you have questions. Students who wish to have their assignments re-graded must submit them to the Lab Coordinator. within 5 class days of their return. The entire assignment will be re-graded so the mark may go up, down or remain unchanged.

7.2 Turnitin

In this course, your instructor will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph. All submitted assignments will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. A major benefit of using Turnitin is that students will be able to educate and empower themselves in preventing academic misconduct. In this course, you may screen your own assignments through Turnitin as many times as you wish before the due date. You will be able to see and print reports that show you exactly where you have properly and improperly referenced the outside sources and materials in your assignment.

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)

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 book their exams at least 7 days in advance and not later than the 40th Class Day.

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 and academic schedules. Any such changes will be announced via CourseLink and/or class email. 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

The University will not normally require verification of illness (doctor's notes) for fall 2020 or winter 2021 semester courses. However, requests for Academic Consideration may still require medical documentation as appropriate.
