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-Requisite(s): BIOC*2580, MCB*2050

Restriction(s):
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 Timetable

- Laboratory: Either Monday & Wednesday or Tuesday & Thursday
  - 1:30 p.m. – 5:20 pm
  - SSC 4108/4109
- Lecture: Friday
  - 1:00 pm – 2:20 pm
  - ROZH 102
- Additional lecture on Mon/Tue of Week 1
  - Monday Labs: Monday 1:30 - 2:30 pm in SSC 1511
  - Tuesday Labs: Tuesday 1:30 - 2:30 pm in SSC 1511

1.3 Final Exam
This course has no final exam during the exam period.

## 2 Instructional Support

### 2.1 Instructional Support Team

- **Instructor:** Dr. Richard Mosser  
  **Email:** rmosser@uoguelph.ca  
  **Telephone:** +1-519-824-4120 x58059  
  **Office:** SSC 3463

- **Lab Co-ordinator:** Amanda Van Der Vinne  
  **Email:** avander@uoguelph.ca  
  **Telephone:** +1-519-824-4120 x56189  
  **Office:** SSC 3519

## 3 Learning Resources

### 3.1 Required Resource(s)

- **Lab Manual (Lab Manual)**  
  MBG*3350 Laboratory Manual: purchased from SSC 2302 the first three days of the semester.

- **Laboratory Notebook (Other)**  
  A bound Laboratory Notebook

- **Lab Coat (Equipment)**

- **Indelible (“Sharpie”) marker: ultra-fine point (Equipment)**

- **Computer Software (Software)**  
  ImageLab (PC and Mac compatible) and CFX Manager (PC compatible): software provided by the lab demonstrator for download on your computer

- **Courselink (Website)**  
  [https://courselink.uoguelph.ca](https://courselink.uoguelph.ca)  
  This course will use D2L (via Courselink). You are responsible for all information posted on the Courselink page for MBG*3350. Please check it regularly.

### 3.2 Additional Resource(s)

- **Library Guide to MBG*3350 (Website)**  
  [https://guides.lib.uoguelph.ca/MBG3350](https://guides.lib.uoguelph.ca/MBG3350)  
  Links to online resources (PubMed, protocols, etc.)
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.

5 Teaching and Learning Activities

5.1 Course Format

• Lecture: One lecture per week on Friday 1:00 p.m. – 2:20 p.m. in ROZ 102. Note that in the first week of class an additional lecture will be presented on Mon/Tue from 1:30 – 2:30 p.m. in SSC 1511 (i.e. during the first hour of the first lab) to ensure that you receive relevant information before you do a lab.
• Laboratory: Two lab sessions per week: Monday/Wednesday or Tuesday/Thursday 1:30 p.m. – 5:20 p.m. in SSC 4108/4109.
• Progress Reports: During the course of the semester you will be required to complete and hand in progress reports (see course outline for due dates). These reports are meant to assist you in continually monitoring the outcomes of your experiments. The reports are designed to have you analyze your results and perform calculations so your formal lab reports are a compilation of results already obtained.
• Literature Review: Before research is conducted one should have a good grasp of what is currently known for the topic/area of study. As such each student will be required to complete a literature review on His-tagged proteins and green fluorescent protein (GFP). Specific details will be presented in lab and on Courselink.
• Formal Lab Report: You are required to write one formal lab report for this course, covering the cloning and analysis of GFP. Although the report will be written in the form of a scientific manuscript, you must remember that the audience and purpose of a formal report is somewhat different than that of a scientific paper. The aim is to show that you understand the principles and
significance of the experiments you performed. Remember your data will have been marked already. What is of importance here is your ability to discuss and interpret cumulative data in a manner that demonstrates an understanding of what you have accomplished in the lab and the relevance of the experiments. Further information and guidelines for your lab report will be available in lab and on Courselink.

5.2 Lecture & Laboratory Topics & Schedule

<table>
<thead>
<tr>
<th>Week/Date</th>
<th>Lab Schedule Day 1</th>
<th>Lab Schedule Day 2</th>
<th>Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 - Jan 7-11</td>
<td>Lecture 1 (Additional 1 h lecture Jan. 7 or 8 in SSC 1511): Course introduction, review &amp; working with <em>E. coli</em></td>
<td>Lecture 2 (Jan. 11): Plasmids: isolation, digestion and analysis</td>
<td></td>
</tr>
<tr>
<td>Week 2 - Jan 14-18</td>
<td>Introduction to the lab, Lab safety, Molecular Biology Review, PubMed Search, Micropipetting, Plating Cultures, Inoculating Cultures</td>
<td>Purification of Plasmid DNA, Restriction Enzyme Digestion of pET-28a, pET-28a Quantification</td>
<td>Lecture 3 (Jan. 18): PCR: theory and applications</td>
</tr>
<tr>
<td>Week 4 - Jan 28-Feb 1</td>
<td>Preparing pET28a and <em>gfp</em> for Ligation. Ligation of <em>gfp</em> into pET28</td>
<td>Transformation of Ligation Reactions into <em>E. coli</em> DH5α. PCR Primer design</td>
<td>Lecture 5 (Feb. 01): qPCR and qRT-PCR</td>
</tr>
<tr>
<td>Week 5 - Feb 4-8</td>
<td>PCR to Determine Presence of Insert. Isolation of transformant plasmid</td>
<td>Isolation of transformant plasmid. Restriction Enzyme Digest and gel</td>
<td>Exam #1 (Feb. 8) on Lectures 1-5 &amp; Labs 1-4 (15%) SA, MC and problem solving questions</td>
</tr>
<tr>
<td>Week 6 - Feb 11-15</td>
<td>qPCR – Isolation of DNA from a Soy sample</td>
<td>qPCR – GMO detection</td>
<td>Lecture 6 (Feb. 15): Recombinant</td>
</tr>
<tr>
<td></td>
<td>Reading Week - No Lab</td>
<td>Reading Week - No Lab</td>
<td>Reading Week - No Lecture</td>
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<tr>
<td>Feb 18 - 22</td>
<td>Reading Week - No Lab</td>
<td>Reading Week - No Lab</td>
<td>Reading Week - No Lecture</td>
</tr>
<tr>
<td>Week 7 - Feb 25-Mar 1</td>
<td>Amplification of your <em>E. coli</em> gene (set up reaction)</td>
<td>His-GFP Purification Ni-NTA resin. Amplification of your <em>E. coli</em> gene (gel)</td>
<td>Lecture 7 (Mar. 1): Protein quantification and analysis by SDS-PAGE</td>
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<tr>
<td>Week 8 - Mar 4-8</td>
<td>Amplification of your <em>E. coli</em> gene (continue until successful)</td>
<td>SDS-PAGE and Coomassie Stain</td>
<td>Lecture 8 (Mar. 08): Southern, Northern and Western blotting</td>
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<tr>
<td>Week 9 - Mar 11-15</td>
<td>SDS-PAGE and Western Immunoblotting</td>
<td>SDS-PAGE and Western Immunoblotting</td>
<td>No Lecture (Mar. 15)</td>
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<tr>
<td>Week 10 - Mar 18-22</td>
<td>qRT-PCR. RNA Isolation from Arabidopsis</td>
<td>qRT-PCR. Arabidopsis Gene Expression Assay</td>
<td>No Lecture (Mar. 22)</td>
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<tr>
<td>Week 11 - Mar 25-29</td>
<td>No Lab</td>
<td>No Lab</td>
<td>Exam #2 (Mar. 29) on Lectures 6-8 &amp; Labs 6-9 (15%). SA, MC and problem-solving questions</td>
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<td>Week 12 - Apr 1-5</td>
<td>No Lab</td>
<td>No Lab</td>
<td>No Lecture (Apr. 5)</td>
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### 6 Assessments

#### 6.1 Marking Schemes & Distributions

<table>
<thead>
<tr>
<th>Name</th>
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<tr>
<td>Literature Review</td>
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<tr>
<td>Name</td>
<td>Scheme A (%)</td>
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<tr>
<td>-----------------------------</td>
<td>--------------</td>
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<tr>
<td>Progress Report #1</td>
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<tr>
<td>Progress Report #2</td>
<td>4</td>
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<tr>
<td>Exam #1</td>
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<tr>
<td>Progress Report #3</td>
<td>4</td>
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<tr>
<td>GMO Assignment</td>
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<tr>
<td>Progress Report #4</td>
<td>4</td>
</tr>
<tr>
<td>Progress Report #5</td>
<td>4</td>
</tr>
<tr>
<td>PCR Report</td>
<td>4</td>
</tr>
<tr>
<td>Lab Report</td>
<td>13</td>
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<tr>
<td>Exam #2</td>
<td>15</td>
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<tr>
<td>Arabidopsis Assignment</td>
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<tr>
<td>Lab Performance</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

6.2 Assessment Details

**Literature Review (10%)**
- **Date:** Jan 25
- **Learning Outcome(s):** 1,5
  - Course Content:
    - Lab Weeks 1-10

**Progress Report #1 (4%)**
- **Date:** Jan 28
- **Learning Outcome(s):** 2,3,4
  - Course Content:
    - Lab Weeks 2-3

**Progress Report #2 (4%)**
- **Date:** Feb 4
- **Learning Outcome(s):** 2,3,4
  - Course Content:
    - Lab Weeks 4
Exam #1 (15%)
Date: Feb 8
Learning Outcome(s): 1,2,3,4

- Course Content:
  - Lectures/Labs Weeks 1-4

Progress Report #3 (4%)
Date: Feb 11
Learning Outcome(s): 2,3,4

- Course Content:
  - Lab Weeks 5

GMO Assignment (4%)
Date: Mar 4
Learning Outcome(s): 1,2,3,4,5

- Course Content:
  - Lab Weeks 6

Progress Report #4 (4%)
Date: Mar 11
Learning Outcome(s): 2,3,4

- Course Content:
  - Lab Weeks 7-8

Progress Report #5 (4%)
Date: Mar 18
Learning Outcome(s): 2,3,4

- Course Content:
  - Lab Weeks 8-9

PCR Report (4%)
Date: Mar 20
Learning Outcome(s): 1,2,3,4

- Course Content:
  - Lab Weeks 4-10

Lab Report (13%)
Date: Mar 28  
Learning Outcome(s): 1,2,3,4,5  
  • Course Content:  
    ○ Lab Weeks 1-10

Exam #2 (15%)  
Date: Mar 29  
Learning Outcome(s): 1,2,3,4  
  • Course Content:  
    ○ Lectures 5-8, Labs 6-9

Arabidopsis Assignment (4%)  
Date: Apr 3  
Learning Outcome(s): 1,2,3,4,5  
  • Course Content:  
    ○ Lab Week 10

Lab Performance (15%)  
Date: Mon, Jan 14 - Fri, Mar 22  
Learning Outcome(s): 2,3,4  
  • Course Content:  
    ○ Lab Weeks 2-10

6.3 Assessment Details

• All assignments and reports are due at 12:00 pm (noon) on the dates indicated. Late Progress Reports are not accepted. All other reports/assignments will be accepted without penalty only for medical or compassionate reasons with documentation. Late assignments without documentation will be penalized 10% per day up to 50%. A grade of zero is assigned after 5 days late.  
• Assignments must be typed, double-spaced, 12-point font.  
• Progress Reports will be returned during your second lab day of the week. This is to provide you with immediate feedback as to whether your analysis, interpretation and conclusion of your experimental results are correct.  
• The lab performance grade is determined by your performance in the lab. Of this, 10% is based on your actual results (success of your experiments). The other 5% is based on your day to day performance in the lab: punctuality,
attendance, attitude, preparedness, independence etc.

6.4 Exams #1 & #2

Exams #1 and #2 will be held during regular lecture time; if you fail to write the Exam #1 a grade of 0% will be assigned unless an acceptable and documented cause such as sickness or family emergency is documented. In the situation where academic consideration is given, Exam #2 will be adjusted to 30%. For missed Exam #2 an Incomplete grade will be submitted with a recommendation of 0% unless academic consideration is granted for a deferred exam.

7 Course Statements

7.1 You must come to lab prepared and ready to start working by 1:30 pm

It is disrespectful to arrive late as this interrupts the TA, your partner and your fellow classmates. Additionally, you will miss out on specific announcements for the day that the TA is not obligated to repeat. If you miss specific safety announcements you may be asked to leave. During the course of the lab there may be times where you can get a coffee as you have a gel running. Feel free to do so, however, if any announcements or discussions take place during your absence you will be responsible for obtaining the information from a fellow classmate.

7.2 Lab Attendance is mandatory

This is a lab based course where the majority of your final grade is assigned based on the laboratory component rather than the lecture component of the course. The nature of the lab exercises also build on one another. As such there is no opportunity for make-up labs. Lab absence is only acceptable for medical or compassionate reasons.

7.3 You must keep a lab notebook

• Before coming to lab you must record in your lab notebook: What are you doing in lab today?
• What are the expected results? You must have completed all calculations that are required to carry out the experiments.
• In addition, you should record the variables of the experiment (reaction conditions), insert the actual results you obtained, in table format or gel image (labelled) and a statement of whether or not the experiment was successful. Your lab notebook will be graded for the PCR assignment.

7.4 All Assignments have to be completed

ALL lab assignments are an important part of the course. Failure to complete an assignment will lead to an “incomplete” at the end of the semester.
7.5 Academic Misconduct

It is the nature of undergraduate labs to complete experiments with a partner. Your results should be discussed with your partner as this is expected in all scientific research. However, ALL assignments must be completed INDEPENDENTLY.

7.6 Grading

• All assignments are due at 12:00 pm (noon) on the dates indicated and are submitted electronically to Dropbox on CourseLink.
• Students who wish to have their assignments re-graded must submit the request to the Lab Demonstrator within 5 class days of their return. The entire assignment will be re-graded so the mark may go up, down or remain unchanged.

7.7 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.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

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.