1 Course Details

1.1 Calendar Description

The course will provide an overview of how biotechnology has impacted biomedical science and animal production. Important principles of recombinant DNA, DNA marker identification, stem cell biology, and generation of transgenic animals will be emphasized. The current challenges and potential opportunities in biotechnology will also be discussed.

Pre-Requisites: MBG*2040 or MBG*2400

1.2 Course Description

The course will provide an overview of how biotechnology has impacted biomedical science and animal production. Important principles of recombinant DNA, stem cell biology, gene editing, and generation of transgenic animals will be focused on. The current challenges and potential opportunities in biotechnology will also be discussed.

1.3 Timetable

Tuesdays and Thursdays, 11:30 am – 12:50 pm

F2F (ANNU Room 156)

There will be two lab sections held on Wednesdays at the weeks below: in-person (F2F)

Time: 8:30 am –10:20 am and 10:30 am - 12:20 pm
Lab sections will be held on:

Lab 1: October 6
Lab 2: October 13
Lab 3: October 20
Lab 4: November 17: Student oral presentations
Lab 5: November 24: Student oral presentation

**COVID-19 Disclaimer:** Please be aware that the information on course delivery, accessibility, and examinations presented in this outline were developed based on current University guidelines. However, due to the continuously evolving situation and resulting changes in public health recommendations, the format and delivery of this course may be revised with limited notice.

1.4 Final Exam

Final Exam on Monday, December 7, 2020, 2:30 pm-4:30 pm

Please see the update in WebAdvisor
Weight: 40%

2 Instructional Support

2.1 Instructional Support Team

Instructor: Nadeem Akhtar
Email: akhtarn@uoguelph.ca
Telephone: +1-519-731-2258
Office: ANNU 251
Office Hours: Online meeting, by appointment

2.2 Teaching Assistants

Teaching Assistant (GTA): Xiaoshu Zhan
Email: xzhan01@uoguelph.ca
Office: Online Communications
2.3 Communicating with your Instructor

Communicating with Your Instructor

During the course, your instructor will interact with you on various course matters on the course website using the following ways of communication:

**Announcements:** The instructor will use Announcements on the Course Home page to provide you with course reminders and updates. Please check this section frequently for course updates from your instructor.

**Email:** If you have a conflict that prevents you from completing course requirements, or have a question concerning a personal matter, you can send your instructor a private message by email. The instructor will attempt to respond to your email within 24 hours.

**Video Call:** If you have a complex question you would like to discuss with your instructor, you may book a video meeting on Teams (or alternate platform being used by your instructor). Video meetings depend on the availability and are booked on a first come first served basis.

3 Learning Resources

No single appropriate textbook is required for this course, but numerous books on related
subjects are available in the library. Basic information can be obtained from recent editions of standard molecular genetics and molecular biology or cell biology texts.

### 3.1 Required Resources

**Required Texts (Textbook)**

Reference Book:

1) *Molecular Biotechnology: Principles and Application of Recombinant DNA*

Publisher: Washington: ASM Press, c2017, 2010,

Author: Glick, Bernard R.

### 3.2 Recommended Resources

**Recommended Texts (Textbook)**

See above, and links to relevant research publications that will be discussed in class will be provided in slides/courselink

### 3.3 Additional Resources

**Lab Manual (Lab Manual)**

Link will be posted on Courselink.

**Other Resources (Other)**

Course slides will be posted online in the courselink.

Student presentation slides will be posted in the courselink. Reference information on relevant research publications that will be discussed in class will be posted on slides/courselink.

**Field Trips (Other)**

Not Applicable
Additional Costs (Other)
Not Applicable

3.4 Course Technology and Technical Support

Course Technologies and Technical Support

System and Software Requirements

This course will use a variety of technologies including;

CourseLink

Lectures:

F2F (ANNU Room 156)
**Student presentations:**

F2F (ANNU Room 110/141)

**Meeting with students during office hours:**

Zoom meeting room: will send invitation upon email request for a meeting

**Labs:**

F2F (ANNU Room 110)

**Midterm and final exams:**

F2F (See updates on CourseLink, or WebAdvisor)

To help ensure you have the best learning experience possible, please review the list of
system and software requirements.

https://opened.uoguelph.ca/student-resources/system-and-software-requirements

**CourseLink System Requirements**

You are responsible for ensuring that your computer system meets the necessary system requirements. Use the browser check tool to ensure your browser settings are compatible and up to date. (Results will be displayed in a new browser window).

http://spaces.uoguelph.ca/ed/system-requirements/
https://courselink.uoguelph.ca/d2l/systemCheck

3.4 System Requirements

**CourseLink System Requirements**

You are responsible for ensuring that your computer system meets the necessary system requirements. Use the browser check tool to ensure your browser settings are compatible and up to date. (Results will be displayed in a new browser window).

http://spaces.uoguelph.ca/ed/system-requirements/
https://courselink.uoguelph.ca/d2l/systemCheck
Course Technologies

CourseLink

This course is being offered using CourseLink (powered by D2L's Brightspace), the University of Guelph’s online learning management system (LMS). By using this service, you agree to comply with the University of Guelph’s Access and Privacy Guidelines. Please visit the D2L website to review the Brightspace privacy statement and Brightspace Learning Environment web accessibility standards.

http://www.uoguelph.ca/web/privacy/ https://www.d2l.com/legal/privacy/
https://www.d2l.com/accessibility/standards/

Technical Support

If you need any assistance with the software tools or the CourseLink website, contact CourseLink Support.

Email: courselink@uoguelph.ca

Tel: 519-824-4120 ext. 56939 Toll-Free (CAN/USA): 1-866-275-1478
Support Hours (Eastern Time):

Monday thru Friday: 8:30 am–8:30 pm

Saturday: 10:00 am–4:00 pm

Sunday: 12:00 pm–6:00 pm

Zoom

This course will use Zoom for lectures. Check your system requirements to ensure you will be able to participate.

https://opened.uoguelph.ca/student-resources/system-and-software-requirements

3.4 Library Access

As a student, you have access to the University of Guelph’s library collection, including both physical and electronic materials. For information on checking out or couriering physical library items, accessing electronic journals and returning items to the library, visit the library’s website.

If you are studying off campus and would like to access the library’s electronic resources, use the Off Campus Login and login using your Single Sign On credentials or using your last name and library barcode.

https://www.lib.uoguelph.ca/
4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Understand the concepts and principles of recombinant DNA and biotechnology, including gene expression regulation, plasmid and virus expression vectors, site-directed mutagenesis, gene editing, microbial as host for recombinant protein production, and animal transgenesis.

2. Critically appraise recent key research papers in the field of biotechnology

3. Effectively communicate concepts and research examples of application of biotechnology in animal and biomedical science.

4. Critically evaluate applications of molecular biotechnology in animal and biomedical science.

5. Acquire applicable laboratory experience by performing experiments involving plasmid isolation and gel electrophoresis.

5 Teaching and Learning Activities

Topics to be covered will include the fundamental concepts and principles underlying gene expression regulation; recombinant DNA biotechnology; the production of recombinant proteins and their applications; gene targeting; gene therapy; animal cloning; transgenic animals; concepts and current research in stem cell biology and relevant applications.
Tentative Lecture Schedule listed below:

### 5.1 Lecture

#### Week 1
**Topics:** Introduction, and history of biotechnology

#### Week 2
**Topics:** Principles underlying gene expression regulation

#### Week 3
**Topics:** Fundamental concepts and principles of recombinant DNA biotechnology.

#### Week 4
**Topics:** DNA library, virus vector, plasmid vector and application

#### Week 5
**Topics:** Microorganism as host for recombinant protein expression and detection.

#### Week 6
**Topics:** Recombinant yeast, feed nutrient improvement using biotechnology approach

#### Week 7
**Topics:** Animal cloning, principles of transgenesis, gene editing, and examples of the application of transgenic animal in animal and biomedical science.

#### Week 8
**Topics:** Animal cloning, principles of transgenesis, gene editing, and examples of the application of transgenic animal in
Week 9

Topics: Principle, concepts, and current research in stem cell biology and relevant applications, gene/cell therapy.

Week 10

Topics: Principle, concepts, and current research in stem cell biology and relevant applications, gene/cell therapy.

Week 11

Topics: Dog cloning, nanotechnology

Week 12

Topics: Student poster presentations (x2)

Week 13

Topics: Application of nanotechnology and summary

5.2 Seminar

Topics: Not Applicable

5.3 Lab

Topics: Labs
There will be two lab sections held on Wednesdays at the weeks below: F2F in room 110

Time: 8:30 am - 10:30 and 10:30 am - 12:20 pm

All lab sections will be held on-line

Lab 1: October 6
Lab 2: October 13
Lab 3: October 20
Lab 4: November 17: Student oral presentations
Lab 5: November 24: Student oral presentations

6 Assessments

6.1 Marking Schemes & Distributions

<table>
<thead>
<tr>
<th>Name</th>
<th>Scheme A (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm</td>
<td>15</td>
</tr>
<tr>
<td>Student Group work (oral and poster presentations)</td>
<td>35</td>
</tr>
<tr>
<td>evaluation of peer posters and presentations</td>
<td>4</td>
</tr>
<tr>
<td>Lab quizzes</td>
<td>6</td>
</tr>
<tr>
<td>Final exam</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

6.2 Assessment Details

Midterm (15%)
- **Date:** Thu, Oct 21, In person see updates on CourseLink
- **Learning Outcome:** 1

Student Group work (oral and poster presentations) (35%)
- **Date:** Multiple dates starting Nov.17. see details, ANNU Room 110/141
- **Learning Outcome:** 2, 3, 4
  - Oral: November 17\textsuperscript{th} and 24\textsuperscript{th} (Lab time)
  - Poster: November 23\textsuperscript{rd} and 25\textsuperscript{th} (Class time)

evaluation of peer posters and presentations (4%)
- **Date:** Multiple dates starting Nov.17. see details, ANNU room 110/141
- **Learning Outcome:** 2, 3, 4
  - November 17, 23, 24, 25

Lab quizzes (6%)
- **Date:** Multiple dates starting Oct 6, see details, ANNU Room 110
- **Learning Outcome:** 5
Quiz dates are: October 6, 1, 20

Final exam (40%)
  Date: Mon, Dec 7, 2:30 PM - 4:30 PM, See update on WebAdvisor/CourseLink
  Learning Outcome: 1
  please see webadvisor

6.3 Student Presentations

1. Student Presentations (35 % of the final grade)

Student presentations will be carried out in groups of five and will involve the presentation of a scientific article provided by the instructor. The significant features of the article must be reviewed, with appropriate background information. Questions such as: Why was this work done? How was it done? What were the main results and conclusions? Has there been any follow-up to this work? should be answered.

Each student will be responsible for one of the 5 aspects of the project:

1. Creating the slides for the presentation, and two multiple choice questions (with expected answers not shown) directly related to the content of the presentation for the class on the last slide. (Note: everyone in the group should help create these two questions)

2. Giving the presentation.

3. Answering questions from the audience.

4. Creating a poster on the paper your group presented.

5. Presenting the poster.

It is expected that all five students will work as a team in preparing the whole project. As a
group, you will decide which student is most suited to each aspect of the final project. The presentation is expected to be of high quality and should be well-practiced. The answers to questions should be confident, accurate, and informative. The presentation will be 15 minutes long with an additional 5 minute discussion/question period. During the poster presentation, the whole group is expected to collaboratively answer questions from the audience.

Each group is expected to come up with two multiple choices questions, relevant to the content presented for the class. The questions are to be posted on the last slide of the presentation.

During each presentation, all other students in the class will answer the two questions from each presentation (on the last slide of each presentation), submit written critical comments (worth 4% of final mark) on their peer’s presentations (other presentation groups) to help the instructor and TAs to arrive at a mark for each group.

All students are expected to be present at these presentations (review the presentation record if unable to attend due to internet issue), perform evaluation, and provide your answers to the two questions stated at the end of each group’s presentation, this response contributes to 4 % of the final mark.

The group component of this project consists of 30% of the overall grade for this project. Out of the 35 possible marks, every member in the group will receive the same grade for 30% of their overall mark. The remaining 70% will be assessed individually for each student according to his/her individual performance for the section they are responsible for. For example: in group A, John is responsible for making the slides from his group presentation, he received 85% on his group’s overall presentation package (\( 35 \times 85\% \times 30\% = 8.92\) marks), and in the specific section he was responsible for (slides), he received 83% thus (\( 35 \times 83\% \times 70\% = 20.33\) marks). So, John’s mark is \( 8.92 + 20.34 = 29.26/35 \) (84%) before group peer evaluation. If John receives no complaints from his groupmates regarding lack of effort in the group work, his final mark will remain \( 29.26/35 \) (84%) as his final mark for the presentation package. If the group members indicated that John didn’t try hard enough to participate in the group work, and only spent 90% of his effort, then John’s final presentation mark will be \( 90\% \times 84\% = 76\% \).

Mark breakdown:
In summary, overall mark (/35) = Overall Group Mark (x.30) + Individual Mark (x0.7) x Group Evaluation.

More specific information regarding poster assessment will be posted on the courseLink.

Meetings between student presentation groups and instructor: Will be scheduled according to the specific available time of the participants

Timetable:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 9</td>
<td>First-class</td>
</tr>
<tr>
<td>October 10</td>
<td>Article distributed for student presentation</td>
</tr>
<tr>
<td>October 12</td>
<td>No class, fall study break</td>
</tr>
<tr>
<td>October 21</td>
<td>Mid-term</td>
</tr>
<tr>
<td>November 23, 25</td>
<td>In-class poster presentation</td>
</tr>
</tbody>
</table>
December 2  | Last class
---|---
See update in WebAdvisor  | Final exam

### 6.4 Final Exam

Final examination date and time: Monday December 7, 2020 2:30pm - 4:30pm

See update in WebAdvisor

Final exam weighting:

40%

### 6.5 Dropbox Submissions

Assignments should be submitted electronically via the online **Dropbox** tool. When submitting your assignments using the **Dropbox** tool, do not leave the page until your assignment has successfully uploaded. To verify that your submission was complete, you can view the submission history immediately after the upload to see which files uploaded successfully. The system will also email you a receipt. Save this email receipt as proof of submission.

Be sure to keep a back-up copy of all of your assignments in the event that they are lost in transition. In order to avoid any last-minute computer problems, your instructor strongly recommend you save your assignments to a cloud-based file storage (e.g., OneDrive), or send to your email account, so that should something happen to your computer, the assignment could still be submitted on time or re-submitted.

It is your responsibility to submit your assignments on time as specified on the Schedule. Be sure to check the technical requirements and make sure you have the proper computer, that you have a supported browser, and that you have reliable Internet access. Remember that **technical difficulty is not an excuse not to turn in your assignment on time.** Don’t wait until
the last minute as you may get behind in your work.

If, for some reason, you have a technical difficulty when submitting your assignment electronically, please contact your instructor or CourseLink Support.

http://spaces.uoguelph.ca/ed/contact-us/

6.6 Late Policy

If you choose to submit assignments to the Dropbox tool late, you will receive a mark of zero on the assignment. Late Graded Homework Assignments will NOT be graded if they are submitted after the solutions have been posted to CourseLink.

Extensions will be considered for medical reasons or other extenuating circumstances. If you require an extension, discuss this with the instructor as soon as possible and well before the due date. Barring exceptional circumstances, extensions will not be granted once the due date has passed. These rules are not designed to be arbitrary, nor are they inflexible. They are designed to keep you organized, to ensure that all students have the same amount of time to work on assignments, and to help to return marked materials to you in the shortest possible time.

6.7 Grades and Feedback

Grades and Feedback

Unofficial assessment marks will be available in the Grades tool of the course website.

Your instructor will attempt to have grades posted online within 2 weeks of the submission deadline, if the assignment was submitted on time. Once your assignments are marked you can view your grades on the course website by selecting Grades from the Tools dropdown menu on the navbar. Your course will remain open to you for seven days following the last day of the final exam period.
University of Guelph students can access their final grade by logging into WebAdvisor (using your U of G central ID).

https://webadvisor.uoguelph.ca

7 Course Statements

7.1 Grading Policies

1. Lab quizzes are to be submitted at the end of the lab sections involved. Late submission is not accepted.

2. Student presentation materials are due **48 hours before** the date of the presentation.

Penalties for late submissions are 1 final mark/day.

*Please note that these policies are binding unless academic consideration is given to an individual student.*

7.2 Course Policy regarding use of electronic devices and recording of lectures

The lectures are solely for the students' use in the course and may not be reproduced or transmitted to others without the express written consent of the instructor.
Electronic recording of classes is forbidden without the consent of the instructor. When recordings are permitted, they are solely for the use of the authorized student. They may not be reproduced or transmitted to others without the express written consent of the instructor.

7.3 Netiquette Expectations

Netiquette Expectations

The course website is considered the classroom and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply. Inappropriate behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students;
- Using offensive language;
- 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;
- 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; and
- Sharing your username and password.

7.4 Technical Skills

Technical Skills
As part of your learning experience, you are expected to use a variety of technologies for assignments, lectures, teamwork, and meetings. In order to be successful in this course you will need to have the following technical skills:

- Manage files and folders on your computer (e.g., save, name, copy, backup, rename, delete, and check properties);
- Install software, security, and virus protection;
- Use office applications (e.g., Word, PowerPoint, Excel, or similar) to create documents;
- Be comfortable uploading and downloading saved files;
- Communicate using email (e.g., create, receive, reply, print, send, download, and open attachments);
- Navigate the CourseLink learning environment and use the essential tools, such as Dropbox, Quizzes, Discussions, and Grades (the instructions for this are given in your course);
- Access, navigate, and search the Internet using a web browser (e.g., Firefox, Internet Explorer); and
- Perform online research using various search engines (e.g., Google) and library databases.

### 7.5 Course Evaluation Information

End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions used as an important component in the Faculty Tenure and Promotion process, and as valuable feedback to help instructors enhance the quality of their teaching effectiveness and course delivery.

While many course evaluations are conducted in class others are now conducted online. Please refer to the Course and Instructor Evaluation Website for more information.
8 University Statements

8.1 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.

8.2 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

8.3 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

8.4 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.
8.5 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

8.6 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

8.7 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.

8.8 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

8.9 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.

8.10 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).

8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

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

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