

Course Outline Form: Fall 2018

General Information

Course Title: ANSC*4050 Biotechnology in Animal Science

Course 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 focused on. The current challenges and potential opportunities in biotechnology will also be discussed.

Credit Weight: 0.5

Academic Department (or campus): Animal and Poultry Science

Campus: Guelph

Semester Offering: Fall

Class Schedule and Location:

Location: GRHM, Room 2310

Tuesdays and Thursdays, 11:30 – 12:50 p.m.

Instructor Information

Instructor Name: Dr. Julang Li

Instructor Email: jli@uoguelph.ca

Office location: ANNU Room 248, extension 52713

Office hours: Thursday 9:30am to 11:00 am

GTA Information

GTA Name: Bo Pan

GTA Email: bopan@uoguelph.ca

GTA office location and office hours: Room 133, ANNU Building; by appointment.

GTA Name: Barret Foster

GTA Email: barret@uoguelph.ca

GTA office location and office hours: Science Complex; by appointment

Course Content

Specific Learning Outcomes:

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

1. Understand the concepts and principles of recombinant DNA and biotechnology, including the 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.

Lecture Content:

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

Tentative schedule:

Wk1: Introduction, and history of biotechnology

Wk2: principles underlying gene expression regulation

Wk3: fundamental concepts and principle of recombinant DNA biotechnology

Wk4: DNA library, virus vector, plasmid vector and application

Wk5: microorganism as host for recombinant protein expression and detection

Wk6: recombinant yeast, animal cloning, principles of transgenesis

Wk7-8: gene editing, and examples of application of transgenic animal in animal and biomedical science, feed nutrient improvement using biotechnology approach

Wk9-10: principle, concepts and current research in stem cell biology and relevant applications, gene/cell therapy

Wk 11-12: Intellectual property regulation and policy, introduction of nanotechnology, student presentations

Wk:13: nanotechnology application, dog cloning/organ-printing, summary

Labs:

There will be two lab sections held on Wednesdays at the weeks below:

08:30AM - 10:20AM and 10:30AM - 12:20PM

All lab sections will be held in ANNU Room 110

Lab 1: October 10

Lab 2: October 17

Lab 3: October 24

Lab 4: November 14: Student poster presentations

Seminars:

N/A

Course Assignments and Tests:

Assignment or test	Due date	Contribution to final mark (%)	Learning outcomes assessed
Scientific magazine article	October 18	15	2, 3, 4
Student group work (oral and poster presentations)	Oral: November 15 th , 20 st , 22 nd Poster: November 14 th	35	2,3, 4
Response to presentation questions and evaluation of peer posters and presentations	November 14,15,20, 22	2	3, 4
Lab quizzes	October 10, 17, 24	6	5
Final exam	December 14, 2:30 - 4:30pm	42	1

Additional notes

1. Scientific magazine article on Biotechnology

Involves preparing a **two-page** article on a topic related to biotechnology in a concise format and language style that would be suitable for a scientific “lay” magazine, such as The Scientist (<http://www.the-scientist.com>). The magazine article will be based on a primary research article published within the last two years.

Major components of the articles that should be addressed:

1. Background of the chosen article: What is the current problem? Or why is this research important?
2. In a simple and understandable manner, describe how the discovery was made.
3. What is the most important result/finding of the study?
4. What does the finding mean or its potential impact for the end users, the producer or patients?
5. Critical analysis: Find and discuss other primary research articles that support and/or contradict the article’s findings.
6. Conclusion: Identify (potential) major issues, problems, or questions surrounding the topic.
7. References: in-text citation, you can pick the format you like on your reference as long as it is consistent throughout your article.

The article will be written double spaced with Times New Roman font size 12. Use reference and citation style from Nature Biotechnology journal. References are to be listed at the end of article (not included in the two page limit).

General research topics include, but are not limited to:

1. Strategies for improving animal disease resistance by recombinant DNA or transgenic approach
2. Improvement of digestion of feedstuffs, or animal growth rate, reproduction by recombinant DNA techniques.
3. Alteration of milk composition.
4. Alteration of wool production
5. Production of "bioactive" proteins by transgenic animals.
6. The molecular analysis of characteristics of an animal that are of importance to animal production.
7. Stem cell and tissue therapy
8. Gene editing, gene therapy
9. Nanotechnology in animal production and veterinary medicine
10. Synthetic Biology and its application

Article examples:

1. Cossins, Dan. "Gene Therapy Coming of Age?" (June 12, 2013). The Scientist. URL: <http://www.the-scientist.com/?articles.view/articleNo/36481/title/Gene-Therapy-Coming-of-Age-/>
2. <http://www.the-scientist.com/?articles.view/articleNo/36994/title/Tumor-Targeting-T-Cells-Engineered/>
3. Smarter contacts, no more needles
<http://www.the-scientist.com/?articles.view/articleNo/39562/title/Smarter-Contacts--No-More-Needles/>
4. <http://www.the-scientist.com/?articles.view/articleNo/37399/title/Genome-Digest/>

2. 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.

The package of this group work includes:

1. Creation of slides for presentation, and creation of two multiple choice questions (with expected answers not shown) directly related to the content of the presentation for the class on the last slide.
2. Give the presentation.
3. Answer questions from the audience.
4. Create a poster on the paper your group presented.
5. Present the poster.

It is expected that all five students will work as a team in preparing the whole project, and will decide which student is most suited to each aspect of the final presentation. 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 14 minutes long with an additional 4 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 5% of final mark) on their peer's presentations (other presentation groups) to help the instructor arrive at a mark for each group.

All students are expected to be present at these presentations (for group presentation, attend the presentations in your lab section), perform evaluation, and provide your answers to the two questions stated at the end of each group's presentation, this response contribute to % of the final mark.

Mark break down:

Poster presentation	10 marks
Oral presentation package (slides, presenter, answering question)	25 marks
Total	35 marks

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 received 85% on his group's overall presentation package ($\therefore 35 \times 85\% \times 30\% = 8.92$ marks), and in the specific section he was responsible for, he received 83% thus ($35 \times 93\% \times 70\% = 20.33$ marks). So John's mark is $8.92 + 20.34 = 29.26/35$ 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. Overall mark ($/35$) = Overall Group Mark ($\times 0.30$) + Individual Mark ($\times 0.7$) \times Group Evaluation. More specific information regarding poster assessment will be posted on course link.

Meetings between student presentation groups and instructor:

Will be scheduled according to the specific available time of the participants

Time table:

September 6 (Thursday)	First class
October 9	No class, fall study break
October 11	Articles distributed for student presentations
October 18	Scientific magazine article due (submit hard copy in class, and an E copy to the drop box)
November 15, 20, 22	In class student oral presentation
November 29 (Thursday)	Last class
December 14	Final exam

Final examination date and time:

December 14, 2:30pm to 4:30 am

Final exam weighting:

42%

Course Resources

Required Texts:

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.

Reference Book:

1) Molecular Biotechnology: Principles and Application of Recombinant DNA

Publisher: Washington: ASM Press, c2017, 2010,

Author: Glick, Bernard R.

Recommended Texts:

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

Lab Manual:

Will be posted on Courcelink.

Other Resources:

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 courselink

Field Trips:

Not applicable

Additional Costs:

It is recommended to bring and wear a lab coat during the lab sections.

Course Policies

Grading Policies

1. Lab quizzes are to be handed in at the end of the lab sections involved. Late submission is not accepted.
2. Scientific article is to be submitted on the due date. There will be 1 mark/day penalty for late submission.
3. 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.

Course Policy regarding use of electronic devices and recording of lectures

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

University Policies

Academic Consideration:

The University of Guelph is committed to supporting students in their learning experiences and responding to their individual needs and is aware that a variety of situations or events beyond the student's control may affect academic performance. Support is provided to accommodate academic needs in the face of personal difficulties or unforeseen events in the form of Academic Consideration.

Information on regulations and procedures for Academic Consideration, Appeals and Petitions, including categories, grounds, timelines and appeals can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

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.

Detailed information regarding the Academic Misconduct policy is available in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Accessibility:

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

For more information, contact SAS at 519-824-4120 ext. 56208 or email sas@uoguelph.ca or visit the [Student Accessibility Services website \(http://www.uoguelph.ca/csd/\)](http://www.uoguelph.ca/csd/).

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.

Drop period:

The drop period for single semester courses starts at the beginning of the add period and extends to the Fortieth (40th) class day of the current semester (the last date to drop a single semester courses without academic penalty) which is listed in [Section III \(Schedule of Dates\) of the Undergraduate Calendar](#).

The drop period for two semester courses starts at the beginning of the add period in the first semester and extends to the last day of the add period in the second semester.

Information about Dropping Courses can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Additional Course Information

N/A.