

# Molecular Genetics and genomics

## BIOL 3623

**Instructor: Dr. Russell Easy**



**Office:** Biology 432

**Office hours:** T, Th 11:00am-2:00pm

**E-mail:** [russell.easy@acadiau.ca](mailto:russell.easy@acadiau.ca)

**Lecture:** M/W/F Huggins 016,  
10:30-11:20am

**Lab:** BIOL 3623, M 1-3:50pm, Rm  
220



Evaluation	Percentage	Date
Midterm Exam	20	Feb 26
Laboratory report	20	April 4
Lab exam	10	March 31
Critique paper	20	April 4
Presentation	20	TBD
Debate	10	TBD

## Part 1: Course Information

### Course Description

*BIOL 3623 is an advanced genetics course that builds upon topics covered in Principles of Genetics (BIOL 3613), with a focus on genomics and genetics of disease. We will explore modern molecular therapies including discussions on the principles of pharmacogenomics and pharmacodynamics. Students will present a critique to the class covering issues in the world of modern molecular practices. Students will also prepare a debate on a topic of their choosing. Papers will be provided throughout the semester that the students are expected to read and discuss throughout the course.*

### Prerequisite

BIOL 2013. The BIOL course(s) used as a prerequisite must be completed with a minimum grade of C-.

### Textbook & Course Materials

#### Suggested Text

Books that may help you understand the course material will be available for one-week reserve at the library

***Course Requirements***

- Access to course [ACORN](#) page
- Vaughn Memorial Library's Biology [LibGuide](#)

***Course Structure***

Lecture material will be presented in 50min lecture slots.

Lectures will take place **M, W, & F** in **Huggins 016 @ 10:30AM-11:20AM**

Labs will take place in BIO 220 on the following days:

**Monday 1:00 – 3:50**

**Labs will begin on January 13<sup>th</sup>, 2025**

***Student Learning Outcomes***

- Acquire an in depth understanding and advanced knowledge of genomics and the genetics of disease.
  - Describe examples of studies demonstrating the relevance of genomics and applications in pathology
  - Develop skills in reading scientific literature. Develop oral communication skills.
  - Develop research skills using research journals and internet databases
- **You will meet the objectives listed above through a combination of the following activities in this course:**
- Attend lectures on a regular basis, take notes, and ask for clarification when something is unclear
  - Study on a regular basis, rather than cram...
  - There will be one midterm exam on Friday, February 28<sup>th</sup>.

***Part 2: Topic Outline/Schedule (Lecture)***

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**Section 1:** Introduction – Review of BIOL 2023

**Section 2:** Genomics

**Section 3:** Genetics of disease

**Section 4:** Medical genetics/Techniques

**Section 5:** The future of genetics

**All Lecture Sets will be available on ACORN.**

**NOTE: In consultation with the class, the instructor reserves the right to amend the above course plan with reasonable notice to you.**

**Critique and Presentations**

Students will construct a detailed critique of a research paper of their choice (< 2 years). They will then present this paper to the class in a 10-minute conference style presentation at the end of the semester. The content and clarity of the presentation, and performance during the discussion afterwards will be graded for each presenter by their peers.

Attendance is mandatory. If you are not presenting, your main job will be to listen and participate in the discussions.

**Debate**

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- Students will pick a debate topic part way through the semester and we will choose opposing sides. The topics must be within the context of molecular genetics. In groups of four students will participate in a debate that will be graded by your peers.

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Students will extract DNA from an enteric bacterium. This will be followed by PCR, product determination by sequencing and agarose gel electrophoresis. Students will choose a suitable restriction enzyme and do an RFLP analysis. PCR products will be cloned into a suitable vector and transformed into competent *E. coli* cells. Transformants will be selected using blue-white insertional inactivation assays. Plasmids will be isolated and products determined by sequencing. Bioinformatics tools will be used for sequence determinations. Methods will be provided and developed as the laboratory exercises proceed.

Kits will be used for the majority of the laboratory work however students will be responsible for understanding each step of the process.

Student will be required to prepare a formal laboratory report (1 report between two individuals).

Students will also have a lab exam worth 10% of their final course grade.

Quizzes will be held at the beginning of each lab and will cover the exercises for that day.

**Part 4: Grading Policy****Grading**

Critique paper	20%	Due April 4
Presentation	20%	TBD
Midterm exam	30%	Feb 28
Laboratory exam	10%	March 31
Formal laboratory report due	20%	April 4

**Bonus seminar mark (5% of class mark up to but not including final):**  
**Attend 2 biology department seminars of your choice throughout the semester and prepare a paragraph detailing the main points of one of the three talks. This will be due on Monday April 3<sup>rd</sup>. Late assignments will be docked 10% daily.**

## Part 3: Assessment and Grading

The assessment schedule is listed at the beginning of the syllabus. Each test will be delivered in class in person during lecture time. Appropriate accommodations will be made for any student who might require them; please contact Accessibility Services to make sure you are getting the supports set up that you need.

If you are sick, or have other valid reasons for missing a test, the weight from the missed test will automatically be distributed among the completed unit tests.

You are required to pass the lab in order to pass the course.

## Part 4: Course Policies

Lab activities are designed to reinforce class content. If you are sick or otherwise unable to come to the lab, please contact me as soon as possible so that we can make alternate arrangements.

## Part 5: University Policies

University policies are available in the Acadia University Academic Calendar or through the Registrar's website:

<https://registrar.acadiau.ca/welcometotheregistrarsoffice.html>

### Equity, Diversity and Inclusion

Acadia University is committed to becoming a culturally safe and anti-oppressive community. This can only be achieved where there are simultaneous efforts to eliminate all forms of discrimination and harassment from our campus community, including the elimination of all discrimination, harassment and violence based on one's identity, including but not limited to, gender, race, class, ethnicity, sexual orientation, disability, gender identity, gender expression, and Indigeneity. The policy against harassment and discrimination, and resources for students who believe they may have experienced, or witnessed, discrimination or harassment, are available here:

<https://www2.acadiau.ca/student-life/equity-judicial/equity.html>

**Last Drop Day**

Last day to drop a course and receive a "W". Please check the Acadia University calendar dates, which are available here:

<https://registrar.acadiau.ca/AcademicCalendars.html>

**Inform Your Instructor of Accommodations**

Acadia University is dedicated to improving access to campus life for all students with disabilities. While we attempt to ensure that all courses are accessible, we recognize that there are barriers that need to be addressed on an individual basis. Students who require accommodations to complete coursework or otherwise fully participate in class should contact Accessible Learning Services directly as soon as possible.

<https://www2.acadiau.ca/student-life/accessiblelearning.html>

**The Use of Animals in Teaching and Research**

The use of animals in teaching and research at Acadia University is done in accordance with guidelines on the care and use of animals published by the Canadian Council on Animal Care (CCAC). For more information on the CCAC, please visit their website at <http://www.ccac.ca>

**Commitment to Integrity**

It is standard practice in Biology to check exams and assignments for cheating and plagiarism. Cheating in the class and/or lab, including plagiarism, will not be tolerated. Please read the appropriate sections of the current Acadia University Academic Calendar:

<https://registrar.acadiau.ca/AcademicCalendars.html>

Information on copy-write and course content from Acadia University is available through the Vaughan Memorial Library:

<http://libguides.acadiau.ca/c.php?g=433650&p=5027078>

The spoken and written course content (including the syllabus, handouts, lectures, presentations, labs, assignments, quizzes, tests, and exams) are the intellectual property of the instructor and may only be copied for personal use. Sharing these materials or uploading them where they may be accessed by others is a violation of copyright. If you wish to make audio, video, or photographic recordings in class, you must first obtain the consent of the instructor and of any other persons (e.g., guest speakers, other students) who may be captured in such recordings. In the case of personal use by students with disabilities, the instructor's consent shall not be unreasonably withheld.

**Part 6: Program Learning Outcomes**

Foundations of knowledge	Course specific examples	Proficiency
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			1-Introduction 2-Reinforcement 3-Proficient
Scientific method, inquiry and hypothesis testing	Find, understand and apply information from the literature; understand how to use the scientific method to examine problems from different perspectives	Process of exploring the flow of genetic information (The Central Dogma of Molecular Biology) in the cell, and biological processes that lead to an identifiable phenotype. Interpretation and discussion of data from literature.	2
Historical concepts and contributions by important figures	Explain foundational concepts in biology, and ethical implications of scientific discoveries	Key discoveries in genetics, Nobel prize awards, ethics of genetic engineering.	2
Biodiversity and ecology	Understand the genetic, taxonomic and ecosystem levels of biodiversity; focus on SW Nova including the Acadian Forest and Bay of Fundy ecosystems	Investigate the role of mutations, gene expression and genetic drift. Genetic adaptations in response to environmental conditions.	2
Genetics and evolution	Understand the chemical basis of heredity, genetics and genomics; integrate concepts across disciplines to understand evolution	Roles of vertical and horizontal gene transfer in organisms. The Central Dogma of Molecular biology	2
Human and environmental health	Understand form and function in health and disease within a One Health framework, integrating human and environmental health	Exploring the genetics of disease and how modern genetic analyses can answer key questions in human pathologies.	1
<b>Lab and field skills</b>			
Experimental design	Gain experience in applying the scientific method	Controls, conducting an experiment, data collection	2
Safety	Work safely and productively in lab and field settings	Basic lab safety protocols	2
Lab skills	Gain experience with basic and advanced lab techniques and understand their application in research, health science and industry	Design, set up and perform polymerase chain reactions (PCR). Pipetting, nucleic acid quantification and integrity determination using agarose gel electrophoresis.	2
Field skills	Gain experience in basic and advanced field skills and understand their application in ecology, conservation biology and environmental change	NA	
Data acquisition, analysis and interpretations	Collect data, present results both qualitatively and quantitatively, and interpret outcomes in light of the literature	Analysis of figures and data from genetic analyses.	2
Statistical analysis	Use R and or other programs to analyze biological data		
<b>Professional skills</b>			
Ethical practices	Demonstrate ethical conduct, apply principles of academic integrity, and understand the principles of EDI in science	Respectful participation in class and lab, proper citation, professional email and other communication	2

Collaboration and group work	Work effectively in groups within and across disciplines	Group collaboration in class and lab activities such as small group discussions, case studies, lab partners and review work	2
Critical thinking	Analyze and evaluate information to make science-based decisions	Question response, discussions, experiment reflection questions, lab observation reflection questions	2
Computer proficiency	Use common and discipline-specific software	Basic bioinformatics tools.	1
Scientific communication	Communicate science effectively to both scientific and general audiences	Lab discussions, lab reports, in-class written responses.	2