

BIOL 2540 Molecular Genetics
Brown-Pfizer Master's Program
Spring 2023
Thursdays 3:00-6:00 PM
Fully Online

INSTRUCTOR:

Professor Richard Freiman: MCB Department, Brown University.
Online Office Hours: TBA or by email appointment.
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COURSE ADMINISTRATOR:

Megan Johnson: MCB Department, Brown University.
Office hours: daily 8:30 AM to 4:30 PM
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COURSE DESCRIPTION:

Even in this era when whole genome DNA sequencing has become routine, there are still thousands of eukaryotic genes with unknown functions. Genetic screens for mutations and dissection of their associated molecular functions that alter pathways of interest remain a premier approach to understanding gene function in the context of an organism. In Molecular Genetics students will learn the key concepts involved in designing and interpreting molecular genetic analyses using the powerful molecular tools available and diverse model organisms. Students will learn fundamental and theoretical concepts in molecular genetics in an effort to understand, analyze and discuss results presented in the primary scientific literature. Furthermore, students will gain an appreciation of how the field of molecular genetics has changed through discoveries and whole genome analyses via next generation sequencing technological advances made over the past decade. Background courses in Biochemistry, Genetics, or Cell and Molecular Biology are recommended to maximize participation in this graduate level lecture and discussion course.

COURSE LEARNING OBJECTIVES:

1. Understand key concepts of molecular biology and genetics.
2. Become familiar with diverse model organisms that provide compelling models of human genetics.
3. Master critical analysis (i.e. strengths and weaknesses) of the molecular genetics primary literature.

4. Balance opportunities of great impact to human health and disease with challenges of implementation.
5. Clearly present recent scientific findings and answer questions about them from the rest of the class.
6. Distill major highlights of a complex research paper into a clear, short and general summary.
7. Understand molecular genetic approaches to identify disease targets and potential therapeutics.

Required Texts & Materials

Lecture Slides and PDFs: On Canvas

Optional textbook for reference: Griffiths et al., Introduction to Genetic Analysis, 12th edition

Course Requirements and Assessments

1. Attendance 10%
2. Class Participation 10%
3. Regularly Scheduled Quizzes 40%
4. Quick Article Summaries 20%
5. Final Presentation 20%

GRADING OPTION: ABC/NC

STUDENT EXPECTATIONS:

Over 14 weeks, students are expected to virtually attend the scheduled 3 hours of in class discussions per week. In addition, students will be required to spend on average 10 hours per week preparing for this course and the majority of this time will be devoted to reading the 2-3 research papers that will be discussed each week in class. Quizzes on alternate weeks will require approximately 4 hours of additional preparation and short article summaries will require 2 hours of preparation on the alternative 6 weeks. A final presentation from each student will take place on the last day of the course and encompasses working with the instructor to choose a molecular genetics paper of your own interest and presenting it to the class in a short (10 minute) oral presentation with slides and answer questions from the audience.

TIME ESTIMATES:

3 hours of in class discussions x 12 classes: 36 hrs.

8 hours per class of reading papers x 12 classes: 96 hrs.

4 hours for quiz preparation x 6: 24 hrs.

2 hours for quick article summary and critique x 6: 12 hrs.

20 hours preparation for final presentation: 20 hrs.

Total expected time for entire course: 188 hrs.

CANVAS WEB SITE:

A BIOL 2540 Molecular Genetics Canvas-based web site will be used throughout the course. It is available at [<http://canvas.brown.edu/>]. It will include the syllabus, announcements, assigned papers, schedule, etc. Links to zoom lecture meetings, office hours and class recordings will all be found on canvas.

STUDENTS WITH DISABILITIES:

Please inform the instructor if you have a disability or other condition that might require some modification of the course procedures. Please speak with the instructor after class, during office hours or by email-arranged appointment. For more information about standard Brown practices, please contact Student and Employee Accessibility Services at 401-863-9588 or SEAS@brown.edu.

ACADEMIC INTEGRITY:

The standard Brown academic code will be enforced in this course. Please refer to the Brown University Academic and Student Conduct Codes for details regarding Brown University's policy on academic integrity and penalties for violating the academic code.

DIVERSITY, EQUITY AND INCLUSION:

This online Molecular Genetics course openly welcomes and supports all students of diverse backgrounds, abilities and interests. As a group and as individuals, we will respect all points of view on the topics presented and discussed. In terms of critiques of the published literature, the presentations, and each other, we will strive to keep them of a productive, professional and constructive nature. With regard to ethical and social aspects of current biology, we all have important and unique perspectives that should be heard and discussed with openness and respect.

**Preliminary
Course Schedule**

Date	Topic	Reading
Jan 26	Course Introduction and Logistics Critical Analysis of Primary Literature	
Feb 2	Genes and Genomes	
Feb 9	Model Organisms and Genetic Screens	
Feb 16	Next generation and single cell RNA-Seq	
Feb 23	No class - Winter/Spring Recess	
March 2	Regulating Gene Expression	

March 9	Epigenetic Regulation
March 16	Molecular Genetic Control of Development
March 23	Stem Cells and Regenerative Medicine
March 30	Trinucleotide Repeat Expansion Diseases
April 6	Cancer Genomics
April 13	Genomic/Precision Medicine
April 20	Human Genome Editing
April 27	Final Presentations I
May 4	Final Presentations II