Welcome to Molecular Biology BIOL 200

Course Description

The course

BIOL 200 is an introductory course that focuses on the understanding of basic molecular biological concepts. As a student in BIOL 200 you will learn basic principles that govern the flow of genetic information from DNA to protein function. You will also be introduced to modern research methods and technologies, and how they are used to advance our understanding of the principles that govern how molecules function to generate and maintain living cellular systems.

We will be using the textbook Molecular Cell Biology by Lodish and colleagues (Macmillan Learning). The most recent (8th), or the previous edition are excellent resources that will also be useful for other courses offered at McGill.

The following topics will be covered in the autumn of 2020.

1. Introduction
2. Building blocks
3. Flow of life
4. Protein structure
5. Protein folding, misfolding, and degradation
6. Protein function and regulation
7. Purification, detection, and characterization of proteins I
8. Purification, detection, and characterization of proteins II
9. DNA replication
10. DNA repair and recombination
11. Molecular biology techniques
12. DNA cloning and experimental gene expression
13. Genes and genomes
14. Transposable elements
15. Chromosomes
16. Molecular Genetics
17. Overview of transcription and mRNA formation
18. Gene regulatory sequences in RNA Pol II promotors
19. Transcriptional initiation
20. Proteins that regulate transcription
21. Chromatin, epigenetics, and the histone code
22. Mechanisms of transcriptional activation and repression
23. RNA Processing I
24. RNA Processing II

25. Alternative splicing and RNA editing
26. Nucleocytoplasmic transport
27. Mechanisms of post-transcriptional control
28. Translation I
29. Translation II
30. Emerging roles for RNA
31. Molecular biology of gene targeting
32. Systems biology approaches

Expectations

Students who would like to take BIOL 200 should have a good basic conceptual understanding of 1) cell biology, including cell structure and cell division, genes and proteins, sexual reproduction and Mendelian genetics, and 2) chemistry, including atomic structure, chemical bonds (covalent, ionic, hydrogen), acid-base reactions and pH, and elementary organic chemistry (chemistry of carbon compounds).

BIOL 112 (Cell and Molecular Biology), or equivalent, is a suggested pre-requisite for BIOL 200, so it may be helpful for you to look over the list of lecture topics covered in BIOL 112 in the associated document “Prerequisite BIOL 112 Lecture Topics (for background self-assessment).”

Organic Chemistry CHEM 212 is currently a suggested co-requisite for BIOL 200 but students can do well in BIOL 200 without CHEM 212 if they have a foundational understanding of carbon chemistry.

If you have concerns about your background knowledge, please look at the associated document “Optional Background Self-Assessment Exercise“

A typical BIOL 200 work schedule for each student should include 3 hours/week of remotely delivered lectures, 1-2 hours/week of online professor-led class discussions, and about 3-4 hours/week devoted to Teaching-Assistant-led online tutorials and/or quizzes, and lecture review/textbook reading, totalling to approximately 9h/week.

Lectures and Learning Resources

This year teaching will be done remotely, but that doesn't mean that it will be inferior! This is a new opportunity to test modern technologies to greatly enhance the learning environment. This will ultimately change how university teaching will take place in the new century! The topics will be the same, but the lectures will be constituted of a combination of pre-recorded videos that cover single concepts along with real-time delivery of lecture material. The course will also have multiple teaching assistants that range from undergraduate peers to graduate students who are currently performing their research in the field of molecular biology and genetics. Professors who are currently engaged in doing cutting edge work in the field of genetics/genomics, molecular, cellular and developmental biology will provide the lecture material. These instructors will also direct real-time (remote) class-time learning experiences that will help students understand and

appreciate better the factual course content.. We will create opportunities for "one on one" discussions with your Professors to discuss any number of topics that range from challenges that you are facing in the course or at the University, or simply for advice about future research avenues that you might want to explore.

Assessments

This year we will not have typical mid-term or final exams to assess your cumulative understanding of the material that was taught during the course. Rather, we will rely on weekly assessments that will encourage students to string concepts from various lectures together to answer short answer and multiple choice questions.

Learning Outcomes/Goals

By the end of the semester students should be proficient in understanding molecular biological concepts and research techniques. Students should be able to comprehend, assess, and be critical of current scientific literature. They will also have acquired a broad familiarity with molecular, genetic, and cellular processes, along with many of the key issues that remain unresolved driving much of modern biological investigation.