

Biology 261 - Molecular and General Genetics

Course Outline and Schedule -- Fall Semester 2020

- Prof. Potvin-Trottier -

1. General information

Biology 261 - Molecular and General Genetics, 3 credits, Fall 2020
WF, 11:45-noon, Online (Zoom link in Moodle)

Instructor: Prof. Laurent Potvin-Trottier, Dept. of Biology, Physics
Office: GE-330.13 (no in person meetings), x3618. laurent.potvin@concordia.ca
Virtual office hours: WF 1:30-2:30pm

Preferred mean of contact: **Slack**, email (please include BIOL 261 in the subject) only for personal questions

TA information to be added when available.

2. Course description

Welcome to Molecular and General Genetics

Genetics is one of the most interesting and important topics in biology. It is a fascinating subject in its own right and also become an extremely important subject for nearly every other speciality within biology. There have been very rapid advances in understanding genetics as well as extensive development of new research and medical diagnostic tools based on recombinant DNA technology and whole genome analysis. We are studying genetics at a momentous time. Genetics and recombinant DNA technology currently have a large impact on science, medicine, agriculture, forensics, and industry.

Genetic research is creating new methods of disease diagnosis and treatment, more efficient ways to create and manufacture pharmaceutical products, new ways to decontaminate polluted land, to genetically improve crops and reduce pesticide use in agriculture, and for forensic identification of victims and criminals. Development of biotechnology also creates controversies including the possibility of discrimination in health insurance based on genetic predisposition to diseases, the loss of personal privacy, economic competition between countries, patenting of genes and organisms as well as the globalisation of new biotechnology.

Course Description from the Concordia Calendar

Basic genetic principles, including mechanisms of meiosis and mitosis, Mendelian genetics, recombination, gene mapping, and chromosome rearrangements; an introduction to molecular genetics, including nucleic acid structure and biosynthesis transcription and translation; the course also includes an introduction to recombinant DNA technology and to concepts of population genetics. Lectures and tutorial.

3. Learning Objectives

At the end of the class, the student should be able to:

- Understand the fundamental principles and molecular mechanisms of *genetic inheritance* (one gene, multiple genes, linkage, interaction between genes)
- Remember the main historical developments in the field of genetics. Understand the experiments and what they showed.
- Understand the basic principles and molecular mechanisms of the central dogma (DNA replication, transcription into RNA, and translation into proteins) and the modulation of gene expression (*molecular genetics*)
- Understand how genes and mutant alleles are distributed through the population (*population genetics*)
- **Apply the learned concepts in new contexts to solve challenging problems in inheritance, molecular, and population genetics**
- Understand the basic tools for manipulating and how they can be used to create, modify, isolate, or amplify genes and genomes of organisms

4. Schedule

Topic	Reading	Dates
Mendel's first law – inheritance for one gene Mendelian inheritance for one gene with multiple alleles Chromosomal basis of genetic inheritance Mitosis, meiosis, Sex determination and sex linkage	Chapter 1 Chapter 2	Sept. 9, 11
Mendel's 2nd Law – independent assortment of genes Inheritance of alleles for 2 or more genes	Chapter 3 (except Chi Squared pg. 86-88).	Sept. 16, 18
The mapping of genes on eukaryotic chromosomes	Chapter 4 (Intro and 4.1, 4.2 and 4.4) Chapter 3, Chi Squared test pg. 86-88	Sept. 23, 25
Gene Interaction One gene one polypeptide Mutation of structural genes - molecular basis Complementation The molecular basis dominant and recessive alleles Gene interactions Modified inheritance ratios 3:1, 9:3:3:1	Chapter 5	Sept. 30, Oct. 2

Review session + problem solving for the midterm		Oct. 7
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MIDTERM EXAM #1 Fri, OCTOBER 9

The Genetics of Bacteria and Their Viruses Auxotrophy, mapping: conjugation, transduction, episomes	Chapter 6 (except pg. 215: Mechanisms of specialized transduction).	Oct. 14, 16
DNA-structure and function DNA as genetic material, historical development: Avery, McLeod, McCarty; Hershey-Chase; Chargaff; Watson and Crick DNA Structure, DNA Replication	Chapter 7	Oct. 21, 23
RNA Transcription and Processing Gene Transcription and RNA processing	Chapter 8, up to and including section 8.3	Oct. 28
Proteins and their Synthesis	Chapter 9	Oct. 30
Control of gene expression The lac operon, attenuation, eukaryotic promoters	Chapter 11, (sections 11.1-11.4), Chapter 12 sections 12.1	Nov 4, 6

MIDTERM EXAM #2 Wed, Nov 11th

Recombinant DNA techniques Restriction endonucleases, ligation DNA cloning, plasmid vectors, DNA cloning, sequencing	Chapter 10	Nov. 13, 18, 20
Population Genetics Allelic frequency in populations Hardy-Weinberg Equilibrium Inbreeding	Chapter 18, sections 18.2-18.3	Nov. 25, Nov 27
Introduction to genomics, complex traits	Optional: Chapter 14, 19	Dec. 2
Review session for the final		Dec. 4

Important administrative dates

Mon., Sept. 21, 2019 (DNE) Deadline for withdrawal with tuition refund from fall-term courses.
 Mon., Nov. 9, 2019 (DISC) Last day for academic withdrawal from fall-term courses.

****SPECIAL COVID-19 TEACHING****

The Fall 2020 semester will be completely online, and the course has been adapted as much as possible to this reality. The following is the outline for the course, but might be subject to changes during the semester to ensure the best learning experience. Some components of the course will be live, but accommodation will be made to ensure students in different time zones can learn efficiently throughout the class.

Lectures

The lectures will be on Zoom during the scheduled class time (link available on Moodle). All lectures will be recorded and posted on Moodle.

You are encouraged to ask questions during the lectures, either via the chat function or by “raising your hand”. Questions will not be answered immediately, but I will regularly pause lecturing and take some time to answer questions.

Clicker questions

I will ask clicker questions through Zoom polls regularly throughout the lectures.

Tutorials

You must attend the section in which you are registered in. During the Zoom tutorials, the TA will start by a quick review of the important concepts and work out a relevant problem step-by-step. Then, you will work in teams (breakout session) on solving the assigned problems. Teams will be formed randomly during the first few tutorials so you have the chance to meet your peers.

Moodle

You have access to the website for Biology 261, Molecular and General Genetics on the university’s Moodle. Access the course Moodle website at <https://www.myconcordia.ca/>, log on and go to Course Websites and then Biol 261.. The site will have the slides for the lectures, the recorded lectures, the list of practice problems for the course, the class schedule and announcements.

Confirm that your email address is updated as announcement will be made regularly. You can access information about your netname on MyConcordia

<https://www.concordia.ca/it/services/netname-account-management.htm>

Slack

To facilitate interactions between the students, the TAs and the professor, we will be using the Slack platform (free). There will be specific channels for announcements, discussion, asking questions about problem solving, course content, etc. **Please review and follow the rules of each channel before posting (pinned in each channel)**. Link to the Slack workspace: cu-biol261-f2020.slack.com

5. Behaviour

Section 5, 6 and 7 are an excerpt from Concordia's course outline [guidelines](#).

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

6. IP

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

7. Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the Academic Regulations, the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes.

8. Course materials

Textbook

Text required: *An Introduction to Genetic Analysis*, 12th edition. Griffiths, Doebley, Peichel and Wassarman

You have multiple purchasing **options** for the textbook (buy only one of them). The solution to the assigned problems will be posted on Moodle. Here are some options:

- **Hardcopy textbook**

ISBN: 9781319114787

TITLE: Introduction to Genetic Analysis

Edition: 12E

Author: Anthony Griffiths; John Doebley; Catherine Peichel; David A. Wassarman

Publisher: Macmillan

- **SaplingPlus (includes interactive eBook and solutions manual)**

ISBN: 9781319114978

TITLE: SaplingPlus for Introduction to Genetic Analysis (Multi Term Access)

Edition: 12E

Author: Anthony Griffiths; John Doebley; Catherine Peichel; David A. Wassarman

- **Textbook & SaplingPlus (includes interactive eBook and solutions manual)**

ISBN: 9781319341060

TITLE: Introduction to Genetic Analysis 12e & SaplingPlus for Introduction to Genetic Analysis 12e (Multi-Term Access)

Edition: 12E

Author: Anthony Griffiths; John Doebley; Catherine Peichel; David A. Wassarman

- **Looseleaf & SaplingPlus (includes interactive eBook and solutions manual)**

ISBN: 9781319341145

TITLE: Loose-leaf Version for Introduction to Genetic Analysis 12e & SaplingPlus (Multi Term Access)

Edition: 12E

Author: Anthony Griffiths; John Doebley; Catherine Peichel; David A. Wassarman

The textbook is available in the university bookstore. There are multiple copies of the textbook and solution manual available at the library.

Earlier editions of the textbook have roughly the same information as the latest 12th edition, but page numbers and numbering of the problem will be different. Most of the problems are identical, although some have been changed after chapter 6. In some cases, topics have been shuffled between chapters, but the topics are still the same. **I will ensure you can follow along if you are using the 11th edition.**

The textbook publisher has a web site for this book and the animations that illustrate key concepts in genetics can be viewed at the Macmillan website. We will see the relevant animations in class.

The link to the SaplingPlus website for our text book is:

<https://www.saplinglearning.ca/ibiscms/course/view.php?id=8308>

9. Grading

The grading scheme is as follows:

- 12% Essays
- 6% Quiz
- 24% Midterm exam #1
- 24% Midterm exam #2
- 34% Final exam

The midterms will evaluate all material covered in lectures up to the date of the midterm. The final will cover material from the entire course.

Exams

The exams will be delivered on COLE **without** proctoring. They will be “open book” in the sense that you will be allowed to look at your notes and textbook. However, it will be **designed such that you should not need to consult your notes at all**. The time you will take to find the information in your book or notes will be time lost on solving other problems.

Multiple mechanisms will be put in place to prevent cheating. You will be asked to submit photos of your scratch work after the exam is completed, every student will have a different exam, etc. The plan is to NOT use a proctoring platform for the exams (unless >2/3 of the class would prefer that). However, if there is clear evidence of cheating in the midterms, I reserve the right to use online proctoring for the final exam to ensure fairness to all students.

Quizzes

Problems are assigned each week. The solutions to these problems will be presented in tutorial the following week. These problems are the subject of the quiz two weeks after they are assigned (and one week after the answers are demonstrated in tutorial). A schedule for the problems and quizzes topics is available on Moodle.

Quizzes will start in the third week of the semester. They will be given every week thereafter: approximately 10 quizzes will be given. Quizzes will be counted as participation. You will get full credit if you answer at least of the questions in the quiz correctly. You will get full credit if you complete 8 out of the 10 quizzes (with at least one question answered correctly).

Quizzes will be delivered on Moodle, to be completed anytime on the Monday of each week (between 12:00am and 11:59pm).

Essays

Take home short essay questions are assigned every other week starting in the second week of the semester. Your top 4 essays (out of ~6) will determine your grade. A grading scheme will be uploaded on Moodle.

MAKE-UP EXAMS

The university allows make-up exams for students who miss the FINAL EXAM for a medical reason with documentation from a physician. Students requesting a medical excuse for the final exam should apply directly to the Birks Student Service Centre, LB-185, (instructions are at <http://www.concordia.ca/students/exams/accommodations/def-note.html>). The make-up exams are given 3 to 9 months after the end of the semester and the delay alone adds difficulty to the exam.

There are no make-up exams for midterm exams or tutorial quizzes.

The grade scale/thresholds used for this course will be:

A+	> 90	C+	>= 67
A	>= 85	C	>= 64
A-	>= 80	C -	>= 60
B+	>= 77	D+	>= 57
B	>= 74	D	>= 54
B-	>= 70	D-	>= 50
		F	<50

Please note that, in exceptional circumstances, the course outline can be subject to changes.

10. Ethical behaviour

The following statements are taken from The Academic Integrity Website (concordia.ca/students/academic-integrity):

Plagiarism:

The most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as “the presentation of the work of another person as one’s own or without proper acknowledgement.” This includes material copied word for word from books, journals, Internet sites, professor’s course notes, etc. It refers to material that is paraphrased but closely resembles the original source. It also includes for example the work of a fellow student, an answer on a quiz, data for a lab report, a paper or assignment completed by another student. It might be a paper purchased from any source. Plagiarism does not refer to words alone –it can refer to copying images, graphs, tables and ideas. “Presentation” is not limited to written work. It includes oral presentations, computer assignment and artistic works. Finally, if you translate the work of another person into any other language and do not cite the source, this is also plagiarism.

In Simple Words:

DO NOT COPY, PARAPHRASE OR TRANSLATE ANYTHING FROM ANYWHERE WITHOUT SAYING WHERE YOU OBTAINED IT!

11. Use of third-party software and websites

We will be using Slack to facilitate interaction in the class. There is no requirement for you to use this software, and the only personal information that you have to provide to join the channel is your name and email.

LIST OF STUDENT SERVICES:

1. Biology Undergraduate Program Assistant: Leonie Morris, leonie.morris@concordia.ca
2. Counselling and Psychological Services: concordia.ca/students/counselling-life-skills
3. Concordia Library Citation and Style Guides: library.concordia.ca/help/howto/citations
4. Student Success Centre: concordia.ca/students/success
5. Health Services: concordia.ca/students/health
6. Financial Aid and Awards: concordia.ca/offices/faao
7. HOJO (Off Campus Housing and Job Bank): csu.qc.ca/hojo
8. Academic Integrity: concordia.ca/students/academic-integrity
9. Access Centre for Students with Disabilities: concordia.ca/offices/acsd
10. CSU Advocacy Centre: csu.qc.ca/advocacy
11. Dean of Students Office: concordia.ca/offices/dean-students
12. International Students Office: concordia.ca/students/international
13. Student Hub: concordia.ca/students