

## Biology 261 - Molecular and General Genetics

### Course Outline and Schedule -- Fall Semester 2016

- Dr. Gulick -

Text: *An Introduction to Genetic Analysis*, 11th edition  
Griffiths, Wessler, Carroll and Doebley

1. Mendel's first law – inheritance for one gene Sept. 7, 9  
Reading: Recommended Chapter 1. Required: Chapter 2  
Mendelian inheritance for one gene with multiple alleles  
Chromosomal basis of genetic inheritance  
Mitosis, meiosis, Sex determination and sex linkage
2. Mendel's 2<sup>nd</sup> Law – independent assortment of genes Sept. 14, 16  
Reading: Chapter 3, except Chi Squared pg. 96-98  
Inheritance of alleles for 2 or more genes
3. The mapping of genes on eukaryotic chromosomes Sept. 21, 23  
Reading: Chapter 4, Intro and 4.1, 4.2 and 4.5  
Chapter 3, Chi Squared test pg. 96-98
4. The Genetics of Bacteria and Their Viruses Sept. 28, 30  
Reading: Chapter 5 (not pg. 200 Mechanisms of specialized transduction)  
Auxotrophy, mapping: conjugation, transduction. Episomes
5. Gene Interaction. Chapter 6 Oct. 5, 7  
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
6. DNA-structure and function. Chapter 7 Oct. 12, 17  
DNA as genetic material, historical development:  
DNA Structure, DNA Replication
7. RNA Transcription and Processing. Chapter 8 Oct. 19  
Gene Transcription and RNA processing  
Reading: Chapter 8, up to and including section 8.3
8. Proteins and their Synthesis. Chapter 9 Oct. 21

MIDTERM EXAM Wed, OCTOBER 26

- |     |  |                 |
|-----|--|-----------------|
| 9.  | Control of gene expression. Chapter 11, pg. 397-413<br><b>(sections 11.1, 11.2, 11.3)</b><br>The lac operon, attenuation, eukaryotic promoters<br>Chapter 12 sections 12.1, 12.2                     | Oct. 28, Nov. 2 |
| 10. | Recombinant DNA techniques. Chapter 10<br><br>Restriction endonucleases, ligation DNA cloning,<br>plasmid vectors, DNA cloning, sequencing<br><br>Reading pages 352-377 (Sections 10.1 through 10.4) | Nov. 4, 9       |
| 11. | Population Genetics. Chapter 18.<br><br>Allelic frequency in populations<br>Hardy-Weinberg Equilibrium<br>Inbreeding<br><br>Reading pages 672-682  | Nov. 16, 18, 23 |
| 12. | Large Scale Chromosomal Changes. Chapter 17<br>Euploidy and Aneuploidy<br>Chromosomal rearrangements<br>Duplication, deletions, inversions, translocations   | Nov. 23, 25     |
| 13. | Genetics and Cancer no reading assigned  | Nov 30          |
| 14  | Genomics, second generation sequencing<br>. – no reading assigned  | Dec 2           |

**Important Administrative DATES**

Mon., Sept 19, 2016 (DNE) Deadline for withdrawal with tuition refund from fall-term courses.

Sun., Nov 6, 2016 (DISC) Last day for academic withdrawal from fall-term courses.

## 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 and there has been 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 to 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.

In this course we will begin with the basic concepts of genetics and develop a foundation on which your education and your public awareness will continue to grow.

### 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

### Objectives

The objectives of the course are to learn the basic concepts of transmission and molecular genetics as presented in the lectures and text book. Students are expected to master problem solving and be able to apply concepts that are learned to new situations.

### Textbook

Text required: *An Introduction to Genetic Analysis*, 11th edition. Griffiths, Wessler, Carroll and Doebley

Text recommended: Solutions Manual for Introduction to Genetic Analysis 11th Edition. Brewster et al

The textbook, solutions manual and iClickers are available in the university bookstore. Four copies of the 11<sup>th</sup> edition and approximately six copies of the 10<sup>th</sup> edition of the textbook are available on 3 hr reserve in the Vanier Library, on the Loyola campus, in the reserve book section. There are also several copies of the solutions manual for the 11<sup>th</sup> and 10<sup>th</sup> edition.

Earlier editions of the text book have the essentially the same information as the latest 11<sup>th</sup> edition but page numbers and problem numbers will be different. I believe all of the problems are identical; so far all that I've checked up to Chapter 6 are the same. This is also true for

editions before the 10<sup>th</sup> edition. In some cases, topics have been shuffled between chapters, but the topics are still the same.

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 WEB site. They grant 21 day free access to anyone and you can read the text book on-line there if you haven't yet obtained your text book. The site is:

<http://www.macmillanhighered.com/launchpad/iga11e/3712354>

We will see the relevant animations in class.

## **ORGANIZATION**

**Lectures.** There are two lectures per week and one tutorial section per week. You should attend all the lectures and your tutorial sessions. Come on time to lectures and don't leave until the lecture is over. Don't talk during lectures except during class discussion. Don't use laptops, smart phones etc. during lectures. Questions are welcome during and after the lectures.

**iClicker.** We will use the iClicker system during lectures to respond to questions and direct discussion. You will need to rent or purchase an iClicker from the bookstore. (Rental is \$21/semester, used iClickers can be purchased for 39.40 and new ones for \$52.) The same iClicker is used in several Biology courses.

**Tutorials,** meet for 2 hours each week. In the tutorial you will meet with a teaching assistant and will work on answering assigned problems. There will also be regular quizzes during the tutorials. You must attend the tutorial section to which you are registered and can only change section with the permission of the professor. You cannot substitute the quiz or essay of your tutorial section with that from another section.

**MOODLE.** You have access to the WEB site for Biology 261, Molecular and General Genetics on the university's Moodle system. Access the course Moodle/WEB site at: <https://www.myconcordia.ca/>, log on and go to Course Websites and then Biol 261. You can log on to the site with your name and student ID. The site will have the slides for the lectures, the list of practice problems for the course, the class schedule and announcements. There is a set of lecture notes for the semester there.

Confirm that your email address is updated, so you can receive announcements for the course. If you haven't yet accessed MyConcordia, information about your netname and access can be found at:

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

### **Office:**

I am available to discuss course material with you. I can meet with you after lectures on most days or you can email me for an appointment at [patrick.gulick@concordia.ca](mailto:patrick.gulick@concordia.ca). I have two offices, SP 375.01 and SP 501.07, it is best contact me by email for an appointment. TAs will also be available for office hours by appointment.

## **GRADING SCHEME**

The grading scheme used in Biol 261 is based on marks from the tutorial section, participation in the lectures with iClickers, the midterm exam and the final exam as follows:

- 18% Tutorial mark
- 28% Midterm exam
- 4% iClicker class participation mark (participating in at least 75% of sessions)
- 50% Final exam

If the final exam mark is higher than the midterm exam mark, the midterm exam score will be ignored and the grading scheme becomes:

- 4% iClicker class participation
- 18% Tutorial
- 78% Final Exam.

**YOU MUST TAKE THE MIDTERM EXAM FOR THIS POLICY TO BE APPLIED.**

The midterm will cover all material covered in lecture up to the date of the midterm. The final will cover material from the entire course, with approximately 30% of the questions coming from material covered before the midterm and 70% from after the midterm.

## **TUTORIAL MARKS**

The mark you receive for your tutorial section counts as 18% of your final grade. The tutorial marks are based on quizzes and take-home short essays. In addition, you will receive points for group oral presentations of the problems during the tutorials that will count toward a bonus mark.

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).

1. Quizzes will start in the third week of the semester and are given every week thereafter except during the midterm week. Approximately 10 quizzes will be given; your 7 best quiz grades will be taken to determine 70% of your tutorial mark (i.e. 12.6 % of your overall score for the course).

2. Short essay questions are assigned each week starting in the second week of the semester, except during the midterm week. Your top six essay scores are taken to determine 30% of your tutorial mark (i.e. 5.4% of your overall score for the course).

3. Problem solving teams. You will be divided into teams of 3 or 4 persons to present the solutions of the problems assigned for the tutorial. You will work with the same team throughout the semester. As a team, you will present the answer to the tutorial class and you will receive a score for this presentation. This is a team score. At the end of the semester, this score will be awarded to each individual as a bonus to be added to your final score.

Bonus scores are very valuable because they are added after the grade distribution is determined. A maximum of 3% can be earned as bonus points. In most cases this is sufficient to raise a grade by one "+/-" unit, i.e. from a B+ to an A-. Thus, the grading for the problem presentations will be rather stringent. On a scale of 0 to 10, an "acceptable" presentation will be scored as 5, a "good" would be a 6 or 7, and a 10 must be excellent. An excellent presentation is one with a correct answer, well explained and orally coherent.

There are grading incentives for performance in each aspect of the tutorials. More importantly, the weekly practice and application of genetic analysis will help you to learn this subject and help you to perform well on the midterm and final exams.

## **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, you apply directly to the Birks Student Service Centre, LB-185, (instructions are at <http://www.concordia.ca/students/exams/accommodations/def-note.html>). However, 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. You are strongly urged to stay healthy and take the final exam. You can improve your chances of remaining healthy by getting sufficient sleep, eating well and avoiding infections by washing your hands regularly, especially before meals.

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

The grade scale used for this course will be:

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

## **Code of Conduct**

### **Plagiarism:**

Plagiarism is the most frequent violation of the Academic Codes of Conduct. Plagiarism is the presentation of someone else's work as your own without proper acknowledgement. This includes using both direct copies and slightly paraphrased text that closely resembles the original. This is a very serious academic offense. You can avoid this offense by quoting the material and acknowledging the original author.

Most importantly, writing and presentation assignments are given to students so they can develop their writing and presentation skills. This is a major objective of university education and the university provides an environment for people to learn by doing and practising. Take each assignment as an opportunity to practice and improve writing and speaking skills.

## **Concordia Services for Students**

**Concordia Counselling and Development** offers career services, psychological services, student learning services, etc.: <http://cdev.concordia.ca/>

**The Concordia Library Citation and Style Guides:**  
<http://library.concordia.ca/help/howto/citations.html>

**Advocacy and Support Services:** <http://supportservices.concordia.ca/>

**Student Transition Centre:** <http://stc.concordia.ca/>

**New Student Program:** <http://newstudent.concordia.ca/>

**Access Centre for Students with Disabilities:** <http://supportservices.concordia.ca/disabilities>

**Student Success Centre:** <http://studentsuccess.concordia.ca/>

**Academic Integrity:** <http://provost.concordia.ca/academicintegrity/>

**Financial Aid and Awards:** <http://web2.concordia.ca/financialaid/>

**Health Services:** <http://www-health.concordia.ca/>