

*This syllabus is a general representation of the course as previously offered and is subject to change.*

## **BIOL 234 – Fundamentals of Genetics**

General Course Syllabus (as of August 2019)

### **About the Course:**

**Course Description:** This course examines fundamental genetic principles, as well as many applications of these fundamentals. Topics include: genotype and phenotype, mechanisms of inheritance, and genetic analysis. Please consult the [Faculty of Science Credit Exclusion Lists](#).

**Course Format:** Lecture and Tutorial

**Credits:** 3

**Prerequisites:** Either:

- (a) BIOL 112 and BIOL 121 or
- (b) SCIE 001 or
- (c) a corequisite of CHEM 203 and one of BIOL 112 or BIOL 121.

### **Course Objectives:**

By the end of this course, students should be able to:

- Define genetics and explain the applications and why it is important.
- Describe the relationship between DNA, a gene, genome, genotype, cell, and mature multicellular organism.
- Recognize and illustrate the features of eukaryotic genes, and describe the function of each of these features.
- Predict the effects of different factors (e.g. mutations, environment) on the genetic mechanisms and phenotype (at any level e.g. mRNA, protein, whole organism)
- Perform a complete genetic analysis of a data set (e.g. results of a cross or pedigree), and analyze the number of genes and alleles involved, dominance relationships and interactions, probabilities of genotype inheritance from parent to offspring.
- Use the scientific method to solve problems, including making predictions, designing an experiment, testing, and modeling.
- Explain how molecular markers (such as SNPs, microsatellites, VNTRs, SSLPs) can be used to map the location of genes/loci.

### **Textbooks and Additional Resources:**

**Textbook (required):** Griffiths, A.J.F., Wessler, S.R., Carroll, S.B. and Doebley, J. 2015. Introduction to Genetic Analysis, 11th Edition. W.H. Freeman and Company, New York.

- EITHER the custom edition OR the 11th edition. The page numbers are the same. (The custom edition is black with a picture of glowing gel bands and two cartoon students. The 11th edition has 3 dogs on the front cover)
- It is **not** recommended to use the 10th edition or any earlier editions. There are changes in text content as well as the chapter problems, and instructors cannot advise on what to read or what problems to do in the older editions.
- The solutions manual to the textbook will not be used, and be informed that there are mistakes in it.

**Canvas (required):** Course materials will be provided on-line using UBC's Canvas interface: [canvas.ubc.ca](http://canvas.ubc.ca).

**iClicker (required)**

### Evaluation:

Assessment	Weight
Tutorials	10%
Reading quizzes	5%
Midterms	30%
Final	55%

\*subject to change

### DETAILS ON ASSIGNMENTS:

**Tutorials:** Attendance in tutorials is mandatory and vital to student success in this course. Students cannot register in a tutorial which conflicts with their lecture. Each tutorial, students can receive up to 0.5 marks for completing tutorial problems and 0.5 marks for a weekly tutorial quiz question. There are 10 tutorials for a total of 10 tutorial marks.

**Reading quizzes:** There are weekly readings and reading quizzes covering material for the upcoming week. The grade on each quiz will be an average based on 2 possible attempts.

**Midterm and Final Exams:** a sheet of notes is allowed for midterm examinations, two for the final exam. Any missed midterm exam(s) must be reported to the course coordinator with supporting documentation and upon approval, the midterm weight will be added to the final exam. Alternatively, a mark of 0% will be entered. There are no "makeup" midterm exams. Any missed final exam must be reported to Science Advising (or appropriate Faculty advising office; see UBC Calendar).

## Schedule of Topics:

Below is a sample schedule from 2018W2 (subject to change; students must always check the course website for possible changes to the schedule):

Week	Topics	Tutorial Problems
1	<p><b><u>PHENOTYPE AND MUTATION</u></b></p> <ul style="list-style-type: none"> <li>- Introduction</li> <li>- DNA, Chromosomes, Genomes, Gene structure</li> </ul>	<b>No tutorial:</b> tutorials start in Week 2 and are based on topics from the previous week
2	<ul style="list-style-type: none"> <li>- Mutations</li> <li>- Phenotype, microsatellites as alleles</li> <li>- Mutations, effects on phenotype</li> </ul>	DNA, Chromosomes, Gene structure
3	<ul style="list-style-type: none"> <li>- Dominance vs. recessiveness, haplosufficiency, putting it all together</li> </ul> <p><b><u>SEGREGATION</u></b></p> <ul style="list-style-type: none"> <li>- DNA replication, mitosis, meiosis</li> <li>- 1 gene, 2 alleles, 3 alleles (genetic analysis)</li> </ul>	Mutation, Phenotypic effects on DNA, RNA, Protein, Cell, Organism, Dominance/recessiveness
4	<ul style="list-style-type: none"> <li>- 2 genes, 2 alleles, problem solving</li> <li>- X-linkage, dosage</li> <li>- Pedigrees, Probability</li> </ul>	DNA replication, Dominance/recessiveness, Mitosis/meiosis, Genetic analysis
5	<p><b><u>LINKAGE</u></b></p> <ul style="list-style-type: none"> <li>- Crossing over, Recombination</li> <li>- Linkage and mapping</li> <li>- Linkage worksheet</li> </ul>	Genetic analysis, X-linkage, Pedigrees, Probability
6	<ul style="list-style-type: none"> <li>- Linkage problem-solving</li> <li>- <b>Midterm #1</b></li> <li>- Group Exam Discussion followed by Individual Question</li> </ul>	<b>No tutorial</b>
7	<ul style="list-style-type: none"> <li>- Molecular markers</li> </ul>	Crossing over, Recombination, Linkage
8	<ul style="list-style-type: none"> <li>- Molecular markers activity</li> </ul> <p><b><u>COMPLEMENTATION</u></b></p> <ul style="list-style-type: none"> <li>- Mutagenesis and Mutant screening</li> <li>- Complementation</li> </ul>	Genetic linkage and molecular markers
9	<p><b><u>APPLICATION OF THE GENETIC PILLARS</u></b></p> <ul style="list-style-type: none"> <li>- Gene Interaction</li> </ul>	Molecular markers, Mutagenesis and mutant screening

	- Enhancer/suppressor screening	
10	- <b>Midterm #2</b> - Group Exam Discussion followed by Individual Question - Changes to chromosome number	<b>No tutorial</b>
11	- Changes to chromosome number - Gene duplication - Somatic cell genetics	Complementation, Gene interaction
12	- Cancer	Enhancer/suppressor, Ploidy
13	- Tying it all together - Review	Somatic cell genetics, Cancer

### **University Policies:**

*UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.*

*UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.*

*UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.*

*UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.*

*Details of the policies and how to access support are available on [the UBC Senate website](#).*