COURSE SYLLABUS
BIOL 2111: GENETICS
Fall 2021

NOTE: this course follows a "Hy-flex" model, where students can choose to experience some face-to-face lab and lecture content, or choose to have only online content (see descriptions in PDF under "Resources" on Blackboard)

INSTRUCTORS: Dr. Daniel Heath (Lectures)
Dr. Julie Smit (Labs)
Keta Patel (Lecture Moderator)
Javad Sadeghi (Lecture Moderator)
Mariah Marentette (Lecture Moderator)

LECTURE HOURS: Tues & Thurs. @ 1:00-2:20 (Blackboard/Hybrid)

LAB HOURS*: Weekly 3-hour synchronous sessions (Blackboard/Hybrid)
Monday 2:30 PM – Friday 11:30 AM
(depending on lab section)

OFFICE HOURS (Heath): Tues. & Thurs. @ 2:30-3:30 PM (Blackboard)

E-MAIL: HEATH: dheath@uwindsor.ca
SMIT: jsmit@uwindsor.ca

PREREQUISITES: BIOL 1101 & 1111

MATERIALS REQUIRED:

1. Textbook (Required): Analysis of Genes and Genomes 9th Ed. (Hartl & Cochrane)
2. Lab Materials (provided on Blackboard)*
3. Computer with stable WiFi

*For all Lab-related information, see "Lab Information" page of Blackboard site.

GRADING:

In-class assessment* (Quizzes)	5%
1st Term Test (Sept. 30th)	12%
2nd Term Test (Nov. 4th)	12%
3rd Term Test (Nov. 23rd)	12%
Final Exam (TBA)	29%
Lab Exercises & Quizzes	15%
Lab Exam (TBA)	15%
TOTAL	**100%**

**In-class assessment will occur most weeks*

ACADEMIC EXPECTATIONS:

1) Students are required to attend all virtual and in-person classes (lectures and labs) on time.

2) No student will knowingly communicate answers or information from any graded material to another student without permission from the instructor

3) If you miss one term test (out of 3) with appropriate documentation (see #5 below), your grade will be pro-rated based on the completed term tests and your lecture final exam grade. If you miss more than one term test or the lecture final exam, you will be required to take make-up tests at the end of classes.

4) To be successful in the lab component of the course, you will need to attend labs and complete required lab assessments (quizzes and exercises). The lab exam will be comprehensive (cover all lab material). Note that if you do not complete a minimum of 70% of the lab exercises and assessments, you may be required to take make-up test(s) at the end of classes. .

5) Self-reporting of medical and compassionate absences: Doctor's notes are NOT required for medical absences. You are asked to use the Illness Reporting form at UWinsite Student to report an illness that will prevent you from completing an assignment on time or taking an exam. For how-to information, please read this ask.UWindsor article. Please do NOT come to campus if you are unwell.

6) Plagiarism and Academic Dishonesty: Plagiarism and other forms of Academic Dishonesty **will not be tolerated** (see below) and all instances will be reported to the Associate Dean of Science for disciplinary action under Senate Bylaw 31: Student Affairs and Integrity. Since tests/exams in this course are protected by copyright, reproduction or dissemination of their contents or format is strictly prohibited. Students who violate this rule or engage in any other form of academic dishonesty will be subject to disciplinary action. This applies to both the lecture and lab components of the course. See detailed Academic Integrity information below.

6) The Student Evaluation of Teaching (SET) will be administered during the last two weeks of course lectures.

BIOL-2111.Genetics
The course reviews transmission genetics and principles of inheritance. The material also includes non-nuclear inheritance and gene linkage, gene expression and regulation, mechanisms and phenotypic effects of DNA mutation and repair, and the principles and applications of population and quantitative genetics. Students will be exposed to molecular genetic techniques such as PCR and DNA sequencing. (Anti-requisite: BIOL-2093; Prerequisite: BIOL-1111 and BIOL-1101.) (3 lecture, 3 laboratory hours a week.)

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

- Explain how DNA is organized, including the chemical basis of heredity.
- Describe the molecular components and mechanisms necessary to preserve and duplicate an organism's genome.
- Discuss the mechanisms by which an organism's genome is passed on to the next generation.
- Demonstrate how one can deduce information about genes, alleles, and gene functions from the analysis of genetic crosses and patterns of inheritance.
- Illustrate how the phenomenon of linkage affects the assortment of alleles during meiosis.
- Explain how the expression of genetic information can affect an organism's structure and function.
- Illustrate how different types of mutations affect genes and the corresponding mRNAs and proteins.
- Describe how gene activity can be altered in the absence of DNA changes (i.e., epigenetics).
- Demonstrate how genes and genomes control changes in an organism's structure and function throughout its life cycle.
- Describe the processes that can affect the frequency of genotypes and phenotypes in a population over time.
- Discuss the experimental methods that are commonly used to analyze gene structure, gene expression, gene function and genetic variants.
- Generate testable hypotheses for genetics phenomena.
- Design a genetics experiment using appropriate controls and sample sizes.
- Gather and evaluate experimental evidence, including qualitative and quantitative data.
- Apply appropriate statistical methods when analyzing experimental data.
- Generate and interpret graphs and tables displaying experimental results.
- Employ suitable genetic and molecular biology laboratory techniques to address research questions.
- Discuss how genetic concepts affect broad societal issues including health and disease, agriculture and natural resources, biotechnology and genetic engineering, and environmental sustainability.

ACADEMIC INTEGRITY:

Code: "*Students of the University of Windsor pursue all endeavours with honour and integrity, and will not tolerate or engage in academic or personal dishonesty"*

Pledge: *"As a student of the University of Windsor, I pledge to pursue all endeavours with honour and integrity, and will not tolerate or engage in academic or personal dishonesty"*

Description: As defined in the Windsor Student Code of Conduct and Senate Bylaw 31 on Academic Integrity, this pledge covers but is not limited to cheating, plagiarizing or misrepresenting the ideas of someone else, unauthorized assistance/collaboration, and falsifying data.

Course Outline:

1. Inheritance (Ch 3 & 1)

- Mendelian Genetics
- Probability
- Pedigrees
- Incomplete Dominance

2. Population Genetics (Ch 18)

- Allele & Genotype Frequencies
- Hardy-Weinberg Principle
- Evolution & genetics
- Inbreeding
- Mutation and migration
- Genetic Drift
- Conservation Genetics

3. Quantitative Genetics (Ch 7)

- Complex Traits
- Variation in Phenotype & Genotype
- Heritability
- Quantitative Trait Loci (QTL)

4. Genes, Chromosomes and Inheritance (Ch 4)

- Chromosomes
- Mitosis & Meiosis
- Chromosomes and Sex Determination
- More Probability and Statistics

5. Linkage & Mapping (Ch 5)

- Linkage & Recombination
- Gene Mapping
- Three-point testcross

6. Chemistry of Genetics (Ch 1, 2, 9, 10)

- Bacteria & Viruses
- DNA = Inheritance?
- Chemistry of DNA
    - replication

7. Chromosomes in Detail (Ch 6 & 9)

- Genome size
- DNA Supercoiling and Structure
- Repetitive Sequences
- Polyploidy
- Chromosome Abnormalities

8. Non-nuclear Inheritance (Ch 17)

- Nature of Non-nuclear Inheritance
- Some Examples

9. Gene Expression & Proteins (Ch 12)

- Proteins & Amino Acids
- Transcription
- RNA Processing
- Translation
- The Genetic Code

10. Gene Regulation (Ch 13)

- Prokaryotes
    - Lac & trp operons
- Eukaryotes
    - Overview

11. Mutation & Intro to DNA Repair (Ch 11)

- What are Mutations?
- Types of Mutations
- Transposable Elements
- DNA Repair

12. Genomics & Transcriptomics (Ch 14) (if time permits)

- Techniques
- Applications
- Ethics