Division of Applied Science & Management
BIOL 202
3 Credit Course
Winter, 2020

COURSE OUTLINE

BIOL 202

GENETICS

3 CREDITS

PREPARED BY: Tara Stehelin, Instructor
DATE: December 16, 2019

APPROVED BY: Stephen Mooney, Interim Dean, ASM
DATE: December 16, 2019

APPROVED BY ACADEMIC COUNCIL: May 1, 2015
RENEWED BY ACADEMIC COUNCIL: Click or tap to enter a date

YUKON COLLEGE

Version 1.2 revised and approved by Academic Council: April 17, 2019

Academic Council, Governance Office
Academic Council MyYC: Policies, Procedures and Forms

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BIOL 202
3 Credit Course
Winter, 2020

GENETICS

INSTRUCTORS: Tara Stehelin, BSc, MSc., PhD Candidate

OFFICE HOURS: Fri 11:00 – 12:30, or by appointment

OFFICE LOCATION: A2806

CLASSROOM: Lecture: TBA
Lab: A2805

E-MAIL: tstehelin@yukoncollege.yk.ca

TIMES: Lecture: M/W,10:30am – 12pm
Labs: Thurs. 2:30 – 5:30 pm

TELEPHONE: (867) 456-6957

DATES: Jan 6 – April 16, 2020

COURSE DESCRIPTION

This core second-year biology course examines patterns of inheritance, genes, and gene functioning from DNA to phenotype. Mendelian patterns of inheritance and exceptions will be discussed and expanded on from introductory material in first-year Biology (Biology 101 and 102). Current topics in molecular techniques, transmission, stem cells, and ethics will also be discussed. Lab exercises will focus on basic quantitative techniques of analysing genetic frequencies and basic methodology in conducting genetic experiments, as well as practise employing the scientific process.

PREREQUISITES

Successful completion of both Biology 101 and 102 or equivalent with a final grade of "C" or higher in both. Successful completion of one semester of a university-level first-year chemistry course.

EQUIVALENCY OR TRANSFERABILITY

Articulation in progress; transfers to most universities in BC as a second-year introductory genetics course. Please contact the School of Science for specific examples or utilize the BCTransfer guide.

LEARNING OUTCOMES

Upon successful completion of this course students will be able to

- describe the processes and functions of mitosis and meiosis in transmitting DNA to other cells,
- explain, with illustrative examples, Mendelian genetics and the exceptions to

these patterns,
- assess and describe the transmission of genes from parent to daughter cells and processes of molecular genetics such as DNA replication, transcription and translation,
- describe the principles of quantitative and population genetics used to describe evolution,
- know and critically assess, genetic techniques such as recombination, cloning, and gene therapy used in modern genetics.

Lab learning outcome:
- Students will be able to demonstrate lab techniques relating to quantitative genetics such as polymerase chain reactions, accurate predictions of phenotypic ratios and statistical assessments of results.

DELIVERY METHODS
Material will be presented in two lectures and one lab session per week. Students will be expected to read and understand scientific articles relating to course material

COURSE FORMAT (3-3-0)
Two 1.5 hour-lectures (3 hours) per week and one 3-hour lab per week-labs begin in the second week of classes, there are no tutorial hours.

ASSESSMENTS
Attendance
Attendance is mandatory in laboratory sessions and strongly recommended in lectures. Students who do not attend a lab session will receive a zero for that day's activities unless the instructor is informed of the absence before the start of that lab. *Students must pass the lab and lecture portions of the course independently.*
Participation
Students are encouraged to engage in discussion relating to the course topics, especially during lab sessions. A portion of lab assignment marks will be related to a student's participation in classroom discussion and presentations.

Assignments
Lab Assignments: Assignments are given during lab sessions and graded on the basis of understanding and applying principles involved as well as the correctness of answers to solutions. For discussion and presentations, marks are awarded for appropriate involvement in classroom discussions or clearly presented results of lab exercises.

Tests
On lecture material: Two midterms on lecture material will be given during regularly scheduled class time. The final examination will be held at the end of the term and covers material from the entire course, although it will focus mostly on the last portion of material. The examination date will be announced as soon as confirmed by administration.

On lab material: Two exams on lab material will be given during assigned lab time and cover material from the lab exercises in the weeks before. There is no final lab exam.

EVALUATION

Lecture		
Two midterms worth 20% each	40%	
Final exam	25%	
Total Lecture		**65%**
Lab		
Laboratory Assignments	17.5%	
Laboratory exams (2) & participation in lab exercises	17.5%	
Total laboratory		**35%**
Total		**100%**

A portion of lab assignment marks (the equivalent of one week's lab mark) will be assigned based on appropriate participation in classroom discussions and short presentations on results of lab exercises.

REQUIRED TEXTBOOKS AND MATERIALS

Essentials of Genetics, 2016, W. S. Klug, M. R. Cummings, C. A. Spencer and M. A. Palladino, 9th Edition, Pearson (or 8th edition is okay too)
With *supplemental material* (not required) from: **Genetic Analysis an integrated approach, 3rd edition**, M. F. Sanders and J. L. Bowman. 2019. Pearson.

Laboratory material will be handed out during the first lab session in the form of three-hole punched pages. Students will be expected to read and understand scientific articles relating to course material.

ACADEMIC AND STUDENT CONDUCT
Information on academic standing and students rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM
Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

YUKON FIRST NATIONS CORE COMPETENCY
Yukon College recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukoncollege.yk.ca/yfnccr.

ACADEMIC ACCOMMODATION
Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): lac@yukoncollege.yk.ca.

TOPIC OUTLINE

UNIT TOPIC	WEEK (approx.!)	Chapter
Introduction		
Comparing Mitosis and Meiosis	1	CH 1 and 2
Basic Mendelian Genetics		CH 3
Monohybrid, dihybrid, and trihybrid crosses	2	
Human genetics: pedigrees		
Statistics, e.g. the chi-square test		
Exceptions to Mendel's Laws	3	CH 4
Sex-linked inheritance		
Sex Determination		
Errors in meiosis, chromosome alteration	4	
and genetic disorders		CH 6
Transmission Genetics		
Linkage and chromosome mapping	5	CH 7
Linkage maps		
Genetic Analysis – bacteria and bacteriophages	6	CH 8

Midterm I **** FEB 10th ****

Molecular Genetics

Structure of DNA, replication of DNA, transcription and translation of DNA to protein (students that have not taken BIOL 201 please read CH 9-12 for review)

Translation of RNA to protein		CH 13
Mutation of genes	7	CH 14
The Genetics of Cancer	8	CH 16
Recombination of genes	9	CH 17

Midterm II ***MARCH 9 ***

Ethics and applications of genetic engineering	10	CH 19
Quantitative Genetics	11	CH 21
Evolutionary Genetics		
Population Genetics	12	CH 22
Human population genetics		
Review	Last class	

Final exam

Lab Topic Outline

Lab 1 - Introduction to the lab, safety, working with live model organisms
Review of mitosis and meiosis; making a squash of pea seedling roots (mitosis) and cricket testes (meiosis)
Exercise on karyotyping chromosomes

Labs 2 and 3 - **Mendelian Genetics** – Introduction to *Drosophila*
Creation (start) of crosses: a monohybrid cross, a dihybrid cross (two types), a sex-linked cross
Start of comparison of two dihybrid crosses to demonstrate gene mapping

Lab 4 – Continuation of Mendelian Genetics crosses, assessment of initial results
Statistical analyses: the chi-square test

Lab 5 – Transduction of phage DNA into bacterial DNA plasmids, use of restriction enzymes, amplification of this DNA, gel electrophoresis of results

Lab 6 – ***LAB QUIZ #1*** (Feb. 20th)
Continuation of lab 5 (if needed) and beginning of *Streptomycin* mutations

Lab 7 - *Streptomycin* mutations II: Sequencing of mutant Gene
Comparison of Mutant Gene to Wildtype Gene

Lab 8 – Gene regulation operon fusion

Mendelian Genetics final lab report – Gene Mapping from a Four-Point Cross of *Drosophila due*

Lab 9 – topic TBA; either DNA amplification using PCR demonstration or gene regulation operon fusion

Lab 10 – **Population Genetics** – activity TBA
Variation in human genetics and the pedigree

Lab 11 - Final Lab Quiz April 2nd