Douglas College

EFFECTIVE: SEPTEMBER 2007
CURRICULUM GUIDELINES

A.	Division:	**Education**	Effective Date:	**September 2007**	
B.	Department / Program Area:	**Faculty of Science & Technology Biology**	Revision	[ ]	New Course [X]
			If Revision, Section(s) Revised:		
			Date of Previous Revision:		
			Date of Current Revision:		

C: **BIOL 3205** **D**: **GENETICS** **E:** **5**

Subject & Course No. | Descriptive Title | Semester Credits

F: Calendar Description:

This course is the study of the principles of genetics. Topics covered include the physical and chemical basis of heredity, genetic analysis in eukaryotes, prokaryotes and viruses, mutation; population genetics and evolution

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture/Tutorial (problem solving)/Laboratory

Number of Contact Hours:

Lecture/tutorial 4 hours/week
Laboratory /practical 3 hours/week

Number of Weeks per Semester:

15

H: Course Prerequisites:

BIOL 1210 or BIOL 1310
or permission of instructor

I: Course Corequisites:

none

J: Course for which this Course is a Prerequisite

none

K: Maximum Class Size:

27

L: PLEASE INDICATE**:**

[ ] Non-Credit
[ ] College Credit Non-Transfer
[X] College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bctransferguide.ca)

M: Course Objectives / Learning Outcomes

Upon completion of this course, students will be able to demonstrate an understanding of the principles of classical and modern genetics, including being able to:

1. Describe the physical basis of heredity.
2. Describe the experimental basis of Mendelian inheritance.
3. Describe sex-determining mechanisms in a wide variety of organisms.
4. Describe non-Mendelian inheritance, including linkage, sex-linkage, sex-influenced inheritance, sex-limited inheritance, multiple allelism, multigenic inheritance, and extra-chromosomal inheritance.
5. Interpret pedigrees to determine modes of inheritance of genetic anomalies in humans.
6. Derive chromosome maps by a variety of techniques, including the analysis of:
   6.1. testcross data in higher organisms
   6.2. tetrad analysis in fungi
   6.3. conjugation, transduction and transformation experiments in bacteria
7. Describe the cytological and biochemical basis of mutation and mutagenesis.
8. Describe the structure, replication, and functions of nucleic acids.
9. Describe the process of protein synthesis and the control of protein synthesis in bacteria and in higher organisms.
10. Describe the genetic control of metabolism.
11. Describe the genetics of populations, including Hardy-Weinberg equilibrium, genetic drift, the effects of selection on allele frequencies and the evolutionary implications of population genetics.
12. Perform and interpret genetic experiments with a variety of organisms.
13. Describe the genetic basis of evolutionary theory.
14. Use general principles of genetics to discuss current issues.

N: Course Content:

The major topics in the course include the following:

1. Mechanics of Inheritance, including:
   1.1. mitosis
   1.2. meiosis
   1.3. life cycles
   1.4. crossing-over
2. Mendelian Inheritance, including:
   2.1. monohybrid inheritance and the Law of Segregation
   2.2. dihybrid inheritance and the Law of Independent Assortment
   2.3. allelic relationships
   2.4. use of testcrosses
3. Probability and Statistics, including:
   3.1. solving genetic problems using probability rules
   3.2. use of the Chi Square test

4. Non-Mendelian Inheritance, including:
   4.1. linkage
   4.2. sex-linked inheritance
   4.3. sex-influenced inheritance
   4.4. sex-limited inheritance
   4.5. gene interactions (including epistasis, complementation, duplicate genes)
   4.6. multiple allelism
   4.7. multigenic inheritance
   4.8. inheritance of quantitative (multifactorial) traits
   4.9. extra-chromosomal inheritance

5. Chromosome mapping in eukaryotes, including:
   5.1. 2 point testcross
   5.2. 3 point testcross

6. Sex determination and sex differentiation, including:
   6.1. the XY system
   6.2. the ZW system
   6.3. the XO system
   6.4. the haplo-diploid system

7. Dosage compensation.

8. Changes in Chromosome Number, including:
   8.1. aneuploidy
   8.2. polyploidy

9. Changes in Chromosome Structure, including:
   9.1. duplication
   9.2. deletion
   9.3. inversion
   9.4. translocations (pericentric and paracentric)

10. Gene mutation and mutagenesis

11. Nucleic acid structure and replication

12. Protein Synthesis
   12.1. transcription
   12.2. translation

13. Control of gene expression
   13.1. in prokaryotes
   13.2. in eukaryotes

14. Microbial genetics, including:
   14.1. prototrophs and auxotrophs
   14.2. replica plating
   14.3. transformation, transduction and conjugation
   14.4. gene mapping

15. Viral genetics, including:
   15.1. DNA Viruses
   15.2. retroviruses

16. Transposable Elements, including:
   16.1. DNA transposons
   16.2. retrotransposons

17. Population genetics and evolution, including:
    17.1. Hardy-Weinberg equilibrium
    17.2. effects of genetic drift and selection

18. Laboratory Exercises
    18.1. mitosis in onion roots
    18.2. chi square (corn crosses)
    18.3. gene mapping in *Drosophila*
    18.4. polytene chromosomes
    18.5. plant viruses
    18.6. population genetics (models of drift and selection; field study)

DOUGLAS COLLEGE SIGNATURE ELEMENTS:

Core Competencies:

a. Oral, written and interpersonal communication:

   Laboratory assignments, in-class assignments, problem sets and all examinations in this course will include writing. Students will work collaboratively in groups on class assignments, problem sets and lab activities.

b. Computational and Information Technology

   Students will use computer technology for all research activities associated with laboratory and reading assignments.

c. Critical and Creative Thinking

   Critical thinking will be essential in problem solving and in analysis of genetic questions in class, tutorial and lab activities.

d. Teamwork

   Students will work in groups on in-class analysis of genetic problems, take-home problem sets, discussion of literature papers, and collection and analysis of lab data.

Academic Signature:

a. Applied Skills (laboratory)

   Students will learn a wide range of laboratory skills typical of genetic investigation and will utilize genetic principles to solve problems involving many practical applications.

b. Ethical behaviour and social responsibility

   Discussion of ethics and social responsibility will occur regarding many issues in the course including the social responsibility of scientists (especially geneticists), genetic manipulation of plants and animals, selective termination of embryos, patenting of life forms, etc.

c. Intercultural, International and Global Perspective

   Many current genetic issues considered in this course are of global importance and many international applications of genetic principles and technology will be discussed. Discussions of ethical and social issues will foster an intercultural perspective.

O: Methods of Instruction

This course involves four hours per week of classroom instruction and three hours per week of laboratory activity. Classroom work will include lectures and tutorials, and is integrated with textbook, scientific journal readings and problem assignments. The laboratory work is designed to complement the theory content of the course, to develop both specific and general lab skills, and to provide exposure to a variety of organisms commonly used as model systems for the study of genetics.

Instructor tutoring and lectures
Discussion groups
Practical applications and lab exercises
Self-study via print or online materials
Reading and problem solving assignments

P: Textbooks and Materials to be Purchased by Students

Will be decided by course instructors. Potential resources include:

Snustad, P.D., and Simmons, M.J. (2005) Principles of Genetics 4th Edition. John Wiley & Sons Inc. Publishers, New York, USA

Q: Means of Assessment

TYPE OF EVALUATION	POINTS
Assignments and tests	10-20
Midterm exams (2)	30-40
Final comprehensive exam	30-35
Lab reports	10-20
TOTAL	100

Grades: A+ 95-100 A 90-94 A- 85-89 B+ 80-84 B 75-79 B- 70-74
C+ 65-69 C 60-64 C- 55-59 P 50-54 F 0-49

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

There is no provision for PLAR, other than normally done by examining transcripts and comparing course outlines of biology courses taken within the last five years to the Biology 3205 course outline.

Course Designer(s): Gerry Meister

Education Council / Curriculum Committee Representative

Dean / Director: Des Wilson

Registrar