

Biology 2CO3: Genetics

Fall 2016

INSTRUCTORS:

Dr. Kim Dej, Ph.D. LSB 425 dejkim@mcmaster.ca

Office hours: TBA

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Office hours: TBA

Instructional Assistant:

Dr. Mihaela Georgescu LSB 119A mgeorg@mcmaster.ca

Office hours: Monday through Friday 10:00-11:30 am and 1:00-2:00 pm, or whenever the door is open.

LECTURES:

JHE/376 Monday, Thursday 12:30 – 1:20 pm

Tuesday 1:30-2:20 pm

COURSE DESCRIPTION:

An understanding of the principles of Mendelian inheritance is a prerequisite to the conceptual understanding of all fields of Biology. The material covered in this course builds upon topics covered in first year Biology, which was an introduction to heredity and the molecular biology of information transfer from DNA to RNA to protein. We take a more detailed examination of how traits are transmitted and how a genotype is expressed as a phenotype. We also explore aspects of chromosomal mapping, linkage, crosses, and mutations and begin to look at genome mapping projects and the application of information from the genome. We also take a look at genes and alleles at the population level and discuss factors that change allele frequency. We also take a close look at polygenic traits, those traits that are determined by multiple genes which include plant growth, human height, and disease. Underlying our examination of inheritance and the expression of phenotype is an understanding of the molecular mechanisms that regulate gene expression.

COURSE OBJECTIVES:

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

- define and solve genetics problems that include data interpretation and problems of statistics and probability.
- interpret, analyze and design scientific experiments
- demonstrate verbal communication skills through regular discussions
- students will develop a scientific attitude towards research and data gathering by practicing the scientific methods: formulation of a hypothesis, experimental testing of predictions.

PREREQUISITES:

Biology 1A03, Biology 1M03 and registration in an Honours program in the Faculty of Science, or a program in Arts & Science, Health Sciences or Kinesiology.

FORMAT:

This course consists of three one-hour lectures and one hour tutorial each week. In tutorials, lecture material, new material, and assignments will be addressed. Therefore, the tutorials represent an integral part of the course work and are mandatory. The penalty for late tutorial assignment is 10% per day.

This course uses **Avenue to Learn** to post the course outline, assignments, and other notices. Go to <http://avenue.mcmaster.ca/> to log-on to the course's home page.

Requirements:

Textbook: We will make reference to the following textbook in lecture and tutorial:

Genetic Analysis – An Integrated Approach, 2nd edition.

Author: Sanders & Bowman Publisher: Pearson

Note: In lieu of this, you could use a comparable Genetics textbook for reference and practice problems.

COURSE EVALUATION:

Midterm	40%
Tutorial quizzes	6%
Tutorial assignments (2)	12%
Participation	2%
Exam	40%

SCHEDULE OF LECTURE MATERIAL:**Week 1 – Dr. Dej**

Sept. 6th - 9th

What is a gene? Mendelian genetics

Case study: Sickle cell disease and the β -globin gene

Week 2 – Dr. Dej

Sept. 12th – 16th

What is a chromosome? Chromosomal basis of inheritance

Case study: Non-disjunction

Week 3 – Dr. Dej

Sept. 19th – 23rd

Chromosome dynamics: Chromosomal basis of inheritance

Case study: The X-chromosome

Week 4 – Dr. Gupta

Sept. 26th – 30th

Gene mapping in eukaryotes

Case study: *Drosophila melanogaster*

Week 5 – Dr. Gupta

Oct. 3rd - 7th

First tutorial assignment – Oct. 6th at 4:00 pm

Molecular maps and sequenced genomes

Case study: Mapping human traits and disease

Week 6 – Fall Break

Oct. 10th - 14th

Week 7 – Dr. Dej

Oct. 17th – 21st

Extensions of Mendelian principles: Genetic interactions

Case study: Eye colour

Week 8 – Dr. Dej

Oct. 24th – 28th

MIDTERM – Oct. 24th 7:00 – 9:00 pm

From multiple genes to quantitative traits

Case study: Plants to humans

Week 9 – Dr. Dej

Oct. 31st – Nov. 4th

Individual to populations: Population Genetics

Case study: β -globin alleles and malaria

Weeks 10 – Dr. Gupta

Nov. 7th – 11th

Chromosomal alterations and Transposable elements

Case study: San Luis Valley syndrome

Week 11 – Dr. Gupta

Nov. 14th – 18th

RNA interference

Case study: *C.elegans*

Week 12 – Dr. Gupta

Nov. 21st – 25th

Mechanisms of regulating gene expression: mRNA processing

Case study: Sex determination in *Drosophila melanogaster*

Week 13 - Dr. Gupta

Nov. 28th – Dec. 2th

Huntington's disease

Second tutorial assignment – Dec. 1st at 4:00 pm

The final exam is not cumulative and is scheduled within the exam period by the Registrar's Office.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

If you are absent from the university for a minor medical/personal reason, lasting fewer than 3 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form. Absences for a longer duration or for other reasons must be reported to your Faculty/Program office, with documentation, and relief from term work may not necessarily be granted.

Please note that the MSAF may not be used for term work worth 25% or more, nor can it be used for the final examination. The MSAF cannot be used to exempt you from taking the tutorial quizzes. The final quiz grade includes the higher 5 marks out of 6 quizzes and the MSAF cannot be used so that the mark would be based on only 4 quizzes.

Immediately after using the online tool, students **MUST contact Mihaela Georgescu (mgeorg@mcmaster.ca)** regarding the nature of the relief. Failure to do so may negate the opportunity for relief.

CHANGES TO THE COURSE OUTLINE:

At certain points in the course it may make good sense to modify the schedule outlined. The instructor reserves the right to modify elements of the course and will notify students accordingly, both in class and on Avenue to Learn). Posted changes take precedence over this course outline. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

ACADEMIC DISHONESTY:

You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behavior can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work. While we encourage you to work with your peers in solving problems on your assignments, copying of answers is not acceptable. Your final work must be your own.
3. Copying or using unauthorized aids in tests and examinations.

Grades obtained in 2C03 will be converted according to the following scheme, which is the one in general use at McMaster University.

90 – 100%	A+	12
85 – 89%	A	11
80 – 84%	A-	10
77 – 79%	B+	9
73 – 76%	B	8
70 – 72%	B-	7
67 – 69%	C+	6
63 – 66%	C	5
60 – 62%	C-	4
57 – 59%	D+	3
53 – 56%	D	2
50 – 52%	D-	1
0 – 49%	F	0

When the final marks are obtained, ALL borderline cases will be reviewed and, where warranted, adjustments will be made in the final mark.