

Bio/MolBiol 2C03: Genetics
Fall 2018

INSTRUCTORS: Dr. Jianping Xu, jpxu@mcmaster.ca
Dr. Ian Dworkin, dworkin@mcmaster.ca

Office hours: Thursdays 2:00-3:30pm

Course Coordinator: Mihaela Georgescu, mgeorg@mcmaster.ca

Teaching Assistants: Karpinski, Emil
MacFarlane, Nicole
Mallick, Avijit
Pesevski, Maria
Samarasinghe, Yapa (Himeshi)
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You, Man

LECTURES: LRW B1007 Monday, Thursday 9:30 – 10:20am, Tuesday 10:30-11:20 am

COURSE DESCRIPTION:

An understanding of the principles of genetics is a prerequisite to the conceptual understanding of all fields of Biology, including medicine. The materials in this course build upon topics covered in first-year Biology. Here, we take a detailed examination of how traits are transmitted and how genotypes and phenotypes are related at the molecular, cellular, individual, and population levels. We will explore aspects of chromosomal mapping, linkage, crosses, and genetic abnormalities, including mutations, mutational effects, and how mutations are repaired. The differences between bacterial genetics and eukaryote genetics will be discussed, including those on the regulations of gene expressions. While most of the materials in the course will be focused on the inheritance of nuclear genes and genomes across generations, the inheritance of organelle genes and through an organism's development will also be discussed. Many phenotypes such as the growth of organisms (including human height) and human diseases are determined by multiple genes. The number of genes and how these genes interact with each other and with environmental factors to influence phenotypes will be discussed. Similarly, we will discuss the factors that influence genes and alleles at the population level. To prepare students for future genetics and other biological studies, we will introduce the selected genetics techniques and approaches throughout the course.

COURSE OBJECTIVES:

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

- have a comprehensive understanding of the major principles of genetics
- define and solve genetics problems that include data interpretation and problems of statistics and probability.
- interpret, analyze and design genetics experiments
- develop genetics vocabulary and verbal communication skills through regular discussions
- develop a scientific attitude towards genetics research and data gathering by practicing the scientific methods: formulation of a hypothesis and 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: Genetic Analysis – An Integrated Approach, 3rd edition.

Author: Sanders & Bowman, Publisher: Pearson

Mastering Genetics is required for grades.

Bio 2C03 COURSE EVALUATION:

Midterm 1	Sept. 27 th	20%
Midterm 2	Nov. 1 st	25%
Tutorial assignments (2)		10%
Dynamic Study Module		3%
Mastering Genetics problems		12%
Exam		30%

MolBiol 2C03 COURSE EVALUATION:

Midterm 1	Sept. 27 th	20%
Midterm 2	Nov. 1 st	23%
Tutorial assignments (4)		15%
Dynamic Study Module		3%
Mastering Genetics problems		12%
Exam		27%

SCHEDULE OF LECTURE MATERIAL:

Week of	LECTURE
Week 1: Sept 4th	<i>Chapter 1: Introduction to Genetics: The Molecular Basis of Heredity, Variation, and Evolution</i> Case study: Sickle cell disease and the β-globin gene
Week 2: Sept 10th	<i>Chapter 2: Transmission Genetics – Mendelian Laws</i> Case study: Pea plant genetics
Week 3: Sept 17th	<i>Chapter 3: Cell Division and Chromosome Heredity</i> Case study: The sex chromosome
Week 4: Sept 24th	<i>Chapter 4: Gene Interactions (allelic and non-allelic)</i> Case study: ABO blood type, Coat colour in mice, and Pleiotropy MIDTERM 1 - Thursday Sept. 27th Covers weeks 1-3 (Chapters 1-3)
Week 5: Oct 1st	<i>Chapter 5: Genetic Linkage and Mapping in Eukaryotes</i> Case study: Drosophila melanogaster and human

	linkage
Week 6: Oct 8th	Fall Break
Week 7: Oct 15th	<i>Chapter 6: Microbial Genetics</i> Case study: Antibiotic resistance
Week 8: Oct 22nd	<i>Chapters 7,8,9: The Central Dogma: DNA replication, transcription, translation</i> Case study: PCR and Sequencing Techniques
Week 9: Oct 29th	<i>Chapters 10, 11: Genome structure, mutations, and repair</i> Case study: Nondisjunction and aneuploidy in humans MIDTERM 2 – Covers weeks 4-8 (Chapters 4-9)
Weeks 10: Nov 5th	<i>Chapters 12,13: Regulation of Gene Expression</i> Case study: antisense RNA
Week 11: Nov 12th	<i>Chapters 14, 15, 16: Genetic and genomic analyses methods</i> Case study: GMO, CRISPR/Cas9, Human eye colour
Week 12: Nov 19th	<i>Chapters 17, 18: Organelle and developmental genetics</i> Case study: organelle diseases
Week 13: Nov 26th	<i>Chapter 19: Quantitative genetics</i> Case study: Human Twin Studies
Week 14: Dec 3rd	<i>Chapter 20: Evolutionary genetics</i> Case study: Sickle cell mutation

Second Tutorial Assignment Due Thursday, Nov 30th 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 Mastering Genetics and the Dynamics Study Module as both are self-paced.

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.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities. <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Once your accommodation was being acknowledged by the instructor, please contact Mihaela Georgescu (mgeorg@mcmaster.ca) to discuss your accommodation needs in the course.

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.