BIOC15 Summer 2016 Genetics Course Official Syllabus Dr. Clare Hasenkampf

WELCOME TO GENETICS!

In this course we consider many important areas of genetic study including eukaryotic patterns of inheritance, genetic mapping, mutation and use of genetics for understanding gene function, chromosome organization and mutation, and Recombinant DNA technology and genome analysis. To take this course you need to have successfully completed BIOB10H, BIOB11H (or BIOB10Y) and *either* a Calculus course that included probability and statistics, or PSYB07 or STAB22, or an equivalent course. Prerequisites are enforced for your benefit and that of the other students in the course.

The knowledge you learn in this course is valuable for the practice of health or veterinary-related science, genetic counseling, genetic diagnostics, the use of genetics and molecular technologies to better understand complex biological processes and systems. It also will help you be a better science-literate citizen in a complex world. If you keep up with the learning activities of this course it also can be fun!

INTERACTION TIMES AND COMMUNICATION METHODS

Lectures for this course are Wednesdays 12:00- 14:00 in SW309 (there are two in-class tests at this time) and Thursdays days 14:00-15:00 in MW170.
Labs are in SW242 on Wed. 14:00- 17:00 (P01) and Thursday 10:00- 13:00 (P03) and Thursday 15:00-18:00 (P02). You must attend the practical you are registered in.

Students organize into teams; each team has some lab work outside of the normal practical meetings May 19 through June 30th (including Reading Week). It is therefore vital that teams equitably distribute the team's lab work and share accurate team experimental data.

Dr. H's regular office hours are
Mondays 16:00-18:00 in SW242 (except no office hrs on Victoria Day, June 20th, or Civic holiday
Tuesdays 17:00- 18:00 in SY246 except not on May 10th

email questions are welcome (hasenkampf@utsc.utoronto.ca), but allow two working days for response time. Dr H will have an extra hour of office hours the day before each test.

Dr. H is available for all questions about lectures and test content and is also able to provide advice about the fly crosses, and general program and post-graduation planning.
For specific aspects of your labs, contact your TA.

LEARNING GOALS FOR GENETICS STUDENTS

1. Students will be able to inter-relate chromosome behavior during meiosis with the key rules of inheritance: segregation of alleles, independent assortment, sex linkage, linkage, and maternal inheritance.

2. Students will combine their knowledge of probability theory with the rules of inheritance to do pedigree analysis and accurately predict genetic outcomes. Additionally students will be able to interpret pedigrees and phenotypic ratios to determine if genes likely are autosomal or sex-linked, linked or sorting independently, and genotypes of parents.

3. Students will develop an appreciation of how genes work within organisms and will be able to use this knowledge to understand and predict phenotypic ratios. Also they will be able to interpret phenotypic ratios to identify the number of genes, allelic relationships, dominance relationships, and types of interaction gene interactions in biological pathways.

4. Students will do genetic crosses using the model organism *Drosophila melanogaster* to deduce the genotype, mode of inheritance, dominance relationship(s) and recombination frequency map distances and interference of several Drosophila genes. These classical genetic techniques will provide students with first hand experience with the rigor and precision needed to perform biological

experiments, and with the difficulties, frustrations and errors that can occur.

5. Students will gain experience working collaboratively as part of a team to accomplish the work of a set of experiments. This includes learning to distribute a task's workload equitably and to give each other productive feedback in a professional and constructive manner.

6. Students will evaluate their data and create a group oral and an individually, personally written report of their experiment that effectively communicate complex ideas to colleagues.

7. Students will efficiently search the primary literature for an article related to their experiment, and provide a concise analysis of key findings of the research article.

8. Students will examine the cellular processes that combat DNA damage and replication errors, and will be able to analyze how mutations can be used to explore biological processes, genome structure and evolution.

9. Students will be able to characterize the types of DNA- and chromosomal mutations and will understand the origins and consequences of these mutations.

10. Students will be able to describe the key molecular technologies that led to the sequencing of the human genome (and other model organisms) and will understand how entire genome sequencing has led to systems approaches to understanding biochemical and developmental pathways, human diseases and related therapeutic approaches.

11. Students will practice communicating as a professional in all communications for this course: emails to TAs and instructor, organization of lab notebook, and oral and written assignments.

To do well in this course it is vital to keep up with the work on a weekly basis: understanding the key concepts, completing assigned activities to develop skill in using the concepts, and doing weekly lab work on time. For example, by Monday of week 2 you will need to understand and be able to use, the material of week 1, etc throughout the course. To help you make a strong start with this learning pattern there will be three online quizzes and a bonus mark opportunity with a mini-practice exam). For these online quizzes and mini-practice exam (you can work cooperatively with friends for the online quizzes and bonus mark but you must each complete the quiz, and you each must be a thinker in the final solutions!)

COMMUNICATION INFORMATION

Course announcements, communications and lecture notes will be available on the BIOC15 Blackboard course site. Be sure you have a Utorid and know how to access the Blackboard sites.
Check the Blackboard site regularly for important, time-sensitive announcements.

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site. Your TA will give you instructions on how to submit your assignment to TurnItIn in advance of the submission deadline.

Lectures notes typically will be posted within 24 hrs AFTER the relevant class meeting. But creating a class with effective learning is a <u>two-way</u> exchange; I need your feedback and interactions to understand how well I am getting the ideas across, so <u>I</u> need many students attending class!

Learn the name of your TA and interact with your TA and fellow students with respect. They are your important learning partners! Questions about lab work and assignments, lab quizzes etc should be addressed to your TA, first.

Course evaluations for this course and all UTSC courses will be done on-line; please participate. Your

assessments and insights are important to me in particular and the university in general!

ABSENCE POLICY

If you are prevented from attending or completing a course requirement (test, lab, or assignment), due to any illness or other circumstance of a grave nature, contact Dr.Hasenkampf by email within three days of the missed requirement, clearly stating the reason. This explanation should be accompanied by a completed 'Verification of illness or injury'- form or other official documentation of the grave circumstance. These documents will be used to determine eligibility to recover any lost marks.

The 'verification of illness or injury' form can be found at http://www.illnessverification.utoronto.ca/getattachment/index/Verification-of-Illness-or-Injury-form-Jan-22-2013.pdf.aspx A copy of the form is provided on the last page of the syllabus. Acquaint yourself with its content such that in case of an emergency you can obtain the essential information required, even in the absence of the official form.

Remember this course is about learning Genetics. When you are well, work hard and engage! If you are sick, take care of yourself, do what you can from home and get back into the swing of the course once you are well. Feel free to contact me for help strategizing for getting caught up.

IMPORTANT ACQUISITIONS

The textbook for this course is Genetics from Genes to Genomes, 1st Canadian edition. It is packed as a bundle with the Solutions manual. The textbook/solutions manual bundle may be purchased at the bookstore.

The lab manual is posted on the Blackboard course site. You need to download your copy and bring the relevant part to each lab.

INFORMATION ON TERM TESTS AND COURSE ASSIGNMENTS

There will be two, IN CLASS term tests (June 1 and July 6) and a comprehensive final exam. The final exam is held during the examination period.

Because there are three major assessments during the term (two term tests and the oral & written Lab Report) there will be no time for makeup test for the two, term tests. Anyone missing either of the term tests (and who has a valid and documented medical or serious personal problem to miss that test) will have access to that test and have access to the answers (for self-assessment), but will recover the lost marks by having to take a final exam which has the relevant portion of the comprehensive final exam more heavily weighted and hence the final exam will be worth more of their final grade.

Anyone without an acceptable (and documentable) reason for missing a test (or assignment or lab) will receive the grade of zero for the relevant work. To be eligible to recover the marks missed on a test, etc. you are required to contact Dr Hasenkampf, within 72 hours of the test or assignment and provide the appropriate medical or other type of documentation within one week of the test.

Test content, and the level of detail of tests and the exam will be as covered in the lecture class notes, assigned problems, assigned independent reading, the figures from the textbook (as assigned in the lecture class notes) definitions in bold in the lab manual and the questions and answers posed within the lab manual. In our class meetings I try to highlight the most important and/or most challenging concepts and applications, but the posted lecture class notes are the definitive source for lecture content that might be included on the two in class tests or the final exam.

Doing well is not just about having a good set of notes! To convert the information in the lecture notes to your own working knowledge of genetics you need to consider the content compared to what you already know, and how you can use the content to solve real world genetic problems. One good way to assess how well you are doing this is to come to class and to fully engage with the learning activities of BIOC15. Best wishes for an exciting learning journey!

FINAL EXAM
The final exam in this course, as in the challenges we face in life, is comprehensive in nature. For BIOC15 this means the exam will assess your working knowledge of our topics from throughout the course. The Final exam will be held in the examination period.
Anyone absent from the Final exam must petition the registrar's office to take a deferred exam.

LAB MEETINGS
Labs start in the second week of classes either May 11th(P01) or May 12th(P02/P03). Each of you is assigned to one practical section that you attend on a weekly basis. In addition to this time period, additional lab work will need to be done by your lab team; some members attend the genetics lab at additional posted times to create your genetic crosses and collect data. Attendance in labs is mandatory; absence will reduce your mark. The success of your genetic crosses requires coordinated teamwork. Please develop a good working relationship and effective communication system with your team members. The ability to work as part of a team is an important life skill; use this course as an opportunity to improve your abilities. The lab work is designed to reinforce the concepts and problems considered in the class meetings and assessed on the tests and exam. If you fully engage with the lab work it will improve your learning in genetics.

MARKING SCHEME FOR THE COURSE

Test 1 June 1st	17 %	In class time (Classes 1-9)
Test 2 July 6th	17 %	In class time (emphasis on Classes 11-17)
Online quiz 1	2 %	material from classes 1-4
Online quiz 2	2 %	material from classes 11-13
Online quiz 3	2 %	material from classes 14-18
Lab performance	12%	(attendance, participation, ability to work fairly and effectively as a team-member, lab assignments.)
Oral report	2%	
Written lab report	10%	
Final exam	36 %	(Comprehensive for all lectures) in final exam period
Bonus mark	*2 %*	*The course will have a 2pt bonus mark opportunity with a practice mini-final exam*

The University of Toronto is dedicated to fostering an academic community in which the learning and scholarship of every member may flourish, with vigilant protection for individual human rights, and a resolute commitment to the principles of equal opportunity, equity and justice. The instructor and Teaching Assistants of BIOC15 fully endorse this policy.

ACADEMIC INTEGRITY
The University treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters* (http://www.governingcouncil. utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

Please avoid academic dishonesty, have confidence in your own ability to learn and grow academically by doing your own thinking and writing! I know you can learn a lot about genetics and yourself in this course.

ACCESSABILITY
Students with diverse learning styles and needs are welcome in this course! In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

SCHEDULE OF LECTURE TOPICS AND IN CLASS TESTS. (Lab schedule is in the lab manual)
Please note this is the topic-order, but we occasionally get a little ahead or a little behind the posted dates.

May 4,5 (C1, C2)	Overview of BIOC15 and Modern Genetics (Chapter sections 1.1- 1.4). Inheritance – Mendel's First and Probability theory (Chapter 2.1), Mendel's Second Law & Probability (Chapter sections 2.2), and Pedigree analysis (2.3)
May 11,12 (C3, C4)	Extensions of Mendelian Analysis: Dominance Relationships and Multiple alleles, wild type and mutant alleles (Chapter sections 2.4 and figures 7.22- 7.24 and related text) How Genes (& the environment) interact to determine phenotypes (Chapter sections 2.4- 2.5) and Using Mutational Analysis to understand how phenotypes are determined (Chapter section 8.3)
Online Quiz 1	Classes 1-4 quiz opens May 12th and closes May 16th 23:59
May 18,19 (C5,C6)	Extensions of Mendelian Analysis: Genes' Products Interactions and Continuous Traits (Chapter section 2.4- 2.5) Chromosome Theory of Inheritance Chromosome organization (Chapter section 6.2); Mitosis (Chapter sections 3.2-3.3)
May 25,26 (C7,C8)	Meiosis (Chapter section 3.3) X-linkage: an exception to Mendel's First Law, Sex Determination, (Chapter sections 3.5) & nonNuclear Inheritance- another exception to Mendel's First Law Test 1 review (class 8)
June 1 (C9)	Test 1 Content for Classes 1-8
June 2 (C10)	Linkage- an Exception to Mendel's Second Law (genes don't always sort independently) (Chapter section 4.1 & 4.3)
June 8,9 (C11,12)	Chi-Square Test and Linkage analysis (Chapter section 4.2) and Mapping genes on chromosomes using recombination frequencies (Chapter section 4.4), Recombination and Special Mapping techniques
Online quiz 2 Classes 10,11,12 quiz opens June 9th and closes June 13th 23:59	
June 15, 16	Reading Week

June 22,23(C13,C14) Karyotype Analysis (Chapter section 3.1)
Chromosome Mutations Rearrangements of parts of chromosomes:
Deletions, Duplications, Inversions (Chapter section 9.1),
Translocations (Chapter section 9.1),
Transposition (Chapter section 9.2),
Position Effect and Karyotype Evolution (bits of Chapter section 9.1 & 9.3)

June 29,30 (C15,16) Mutations: Changes in the Number of Chromosomes
Aneuploid changes and Sources and Euploid changes and Sources (Chapter section 9.4)
Review for Test 2 (class 16)

July 6 (C17)	Test 2 Emphasis is on Classes 10-16

July 7 (C18) DNA damage, Gene Mutation and DNA Repair Mechanisms Chapter section 8.1

July 13,14 (C19, 20) DNA damage, and DNA repair continued Chapter section 8.1
Molecular Biology and Recombinant DNA Technology Chapter Section 14.1

July 13,14	Oral reports done in lab practicals (a chance to get feedback from colleagues

Online quiz 3	Classes 18,19,20 quiz opens July 14th and closes July 18th 23:59

July 20,21 (C21,22) Molecular Biology and Recombinant DNA technology, continued
Chapter sections 14.2-14.6
The Human Genome Sequencing Initiative

July 22	Lab reports are due on Friday July 22nd, by 10 am. <u>The report must be completely in your own words.</u> Papers must be submitted via TURNITIN; your TA will provide instructions on how to use TURNITIN.

Life happens; there is a grace period until Monday July 25th. Once the grace period has ended there is a 5pt per day penalty for each working day late--submitted after 10 am July 26th minus 5 pts, submitted after 10 am July 28th minus 10 pts *etc*.

July 27,28 (C23,C24) Post Sequencing Technologies and Genomic Approaches to Genetics

2% Bonus Option Take a mini practice exam quiz (after you do course evaluations, please) quiz opens July 25 and stays open through August 2nd 23:59

I look forward to exploring the marvels of Genetics with you this term! Welcome!