

**Course Number (MDSC 541)
Advanced Genetics**

Instructors:

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Office Hours/Policy on Answering Student Emails

By appointment (usually available on short notice), emails are answered within 24 hours.

Time and Location:

Tuesday/Thursday, 9:30 – 10:50 (lecture) followed by tutorial till 11:20.
All meetings are in G750 except as noted on the class schedule.

Prerequisite/Co-Requisite:

Medical Science 341 or Biology 311.

Course Description:

Historical papers will illustrate the foundations of the fundamental principles of modern transmission genetics. Topics including the chromosomal theory of inheritance, the role of pairing and recombination for chromosomal disjunction during meiosis, cytogenetics, the nature of dominant mutations, genetic screens and genetics analysis of developmental pathways. Material covered is drawn from model organisms and humans.

Overarching Theme

Lecture format with fewer than 20 students. Lectures provide the background so that students can understand and present oral presentations on papers assigned from the primary literature.

Global Objectives

To give the student a solid background in traditional transmission genetics and to acquaint students with contemporary genetic methods commonly used in model organisms.

Course Learning Outcomes

By the end of this course, students will be able to:

- Understand the relationship between recombination and chromosome disjunction during meiosis.
- Infer gene activity based on gain and loss of function mutations.
- Use genetic interactions to order genes in pathways.
- Understand the genetic methodologies available in yeast, worms, flies, zebrafish, mice and

humans used in the current primary literature for these organisms.

- Prepare and deliver oral presentations based on the primary literature.

Transferable Skill Development:

Many of the skills and abilities that you are developing in your coursework are transferable to the workforce, graduate and professional studies and other facets of life. Employers seek applicants with transferable skills because they can be an asset in the workplace, regardless of industry or sector. Transferable skills are core skills for your success in building your future career.

The work that you will do in MDSC 541 will help you build the following transferable skills:

- **Verbal Communication:** Learn and share information by presenting, listening, and interacting with others.
- **Critical Thinking:** Actively and skillfully conceptualize, apply, analyze, synthesize, and/or evaluate information (data, facts, observable phenomena, and research findings) to make a reasoned judgement or draw a reasonable conclusion.
- **Information Literacy:** Find, understand, and use information presented through words, symbols, and images
- **Written Communication:** Share ideas and information by using words, images, and symbols.

Learning Resources

No textbook, all required readings will be posted on D2L.

Recommended Textbooks/Readings

Supplemental reading will be posted on D2L.

A Note regarding readings

A list of required readings will be outlined on D2L and links and documents will be made available, where possible. Required readings have been chosen carefully to inform you and enhance the lecture material. Students should be aware that many of the readings they will be assigned may be of an unfamiliar nature and style. Students should allot sufficient time to allow for several reads of the assigned material.

Learning Technology Requirements

Brightspace (by D2L) is located on the University of Calgary server and will be used extensively for communication with students. **It is the student's responsibility to ensure that they receive all posted communications and documents and that they receive emails sent by instructors or fellow students through D2L.** Only your @ucalgary.ca email address may be linked to D2L. Please ensure that you are regularly checking your @ucalgary.ca account.

Evaluation

The University policy on grading and related matters is described in section F of the 2022-2023 Calendar.

In determining the overall grade in the course, the following weights will be used:

Participation	8%	Asking questions during student talks and attending non-Mains lectures
Homework	25%	Students can work together

Take home quiz 1	8%	Open book, but students can NOT work together
Take home quiz 2	12%	Highest mark on the two quizzes counts for 12%
Talk 1	14%	Individuals will be assigned papers
Talk 2	18%	Individuals will be assigned papers
Paper	15%	News & Views style, based on Talk 1 or 2

There is no final exam. Details of expectations for Quizzes, Talks and the Paper will be posted on D2L. In general, clarity is most important, followed by brevity. Plagiarism will not be tolerated. All assignments are Open Book. A student's final grade for the course is the sum of the separate assignments. It is not necessary to pass each assignment separately in order to pass the course.

A Note regarding Writing Assignments:

Writing skills are important to academic study in all disciplines. In keeping with the University of Calgary's emphasis on the importance of academic writing in student assignments (section E.2 of 2022-23 Calendar), writing is emphasized, and the grading thereof in determining a student's mark in this course. The Bachelor of Health Sciences values excellence in writing. Competence in writing entails skills in crafting logical, clear, coherent, non-redundant sentences, paragraphs and broader arguments, as well as skills with the mechanics of writing (grammar, spelling, punctuation). Sources used in research papers must be properly documented. The University of Calgary offers instructional services through the Students' Success Centre's Writing Support Services (<http://www.ucalgary.ca/writingsupport/>) for students seeking feedback on assignments or seeking to improve their general writing skills. Students are **strongly encouraged** to take advantage of these programs.

Grading Scheme:

Letter Grade	Description	Percentage
A+	Outstanding performance	96-100
A	Excellent performance	90-95.99
A-	Approaching excellent performance	85-89
B+	Exceeding good performance	80-84
B	Good performance	75-79
B-	Approaching good performance	70-74
C+	Exceeding satisfactory performance	65-69
C	Satisfactory performance	60-64
C-	Approaching satisfactory performance	57-59
D+	Marginal pass	54-56
D	Minimal pass	50-53
F	Does not meet course requirements	0-49

Missed Components of Term Work:

Students will lose 25% per day late past the deadline for all assignments. In this case, assignments will **NOT** be accepted more than 72 hours after the posted deadline and students failing to submit any assignment within this time frame will receive a mark of zero. **Students who miss a quiz will receive a mark of zero unless the instructor has been previously notified. There will be NO exceptions to this policy.**

Extensions will NOT be granted on any assignment or quizzes in MDSC 541. The only exceptions to this are those in keeping with the University Calendar (debilitating illness, religious conviction, or severe domestic affliction) that are received in writing and with supporting documentation. Traffic jams and late or full buses are common events in Calgary and are NOT acceptable reasons for late arrivals to class, meetings and examinations. Please note that while absences are permitted for religious reasons, students are responsible for providing advance notice and adhering to other guidelines on this matter, as outlined in the University Calendar (<https://www.ucalgary.ca/pubs/calendar/current/e-4.html>).

Course Evaluations and Student Feedback

Student feedback will be sought at the end of the course through the Universal Student Rating of Instruction (USRI) and a qualitative student evaluation. Students are welcome to discuss the process and content of the course at any time with the instructor. Students may also address any concerns they may have with Dr. Ebba Kurz, Associate Dean (Undergraduate Health and Science Education) in the Cumming School of Medicine (kurz@ucalgary.ca).

Attendance

4% of the grade is given for attending guest lectures.

Conduct During Lectures

The classroom should be respected as a safe place to share ideas without judgement - a community in which we can all learn from one another. Students are expected to frame their comments and questions to lecturers in respectful and appropriate language, always maintaining sensitivity towards the topic. Students, employees, and academic staff are also expected to demonstrate behaviour in class that promotes and maintains a positive and productive learning environment.

As members of the University community, students, employees and academic staff are expected to demonstrate conduct that is consistent with the University of Calgary Calendar, the Code of Conduct and Non-Academic Misconduct policy and procedures, which can be found at <https://www.ucalgary.ca/legal-services/university-policies-procedures>.

Students are expected to take notes during class and should not rely solely on material supplied by the instructors.

Use of Internet and Electronic Communication Devices in Class

The Bachelor of Health Sciences program aims to create a supportive and respectful learning environment for all students. The use of laptop and mobile devices is acceptable when used in a manner appropriate to the course and classroom activities. However, research studies have found that inappropriate/off-topic use of electronic devices in the classroom negatively affects the learning of others during class time.

Students are responsible for being aware of the University's Internet and email use policy, which can be found at <https://www.ucalgary.ca/policies/files/policies/electronic-communications-policy.pdf>.

UNIVERSITY OF CALGARY POLICIES AND SUPPORTS

Copyright

All students are required to reach the University of Calgary policy on Acceptable Use of Material Protected by Copyright (<https://www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright-policy.pdf>) and requirements of the Copyright Act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorized sharing of course materials (including instructor notes, electronic versions of textbooks, etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy <https://www.ucalgary.ca/pubs/calendar/current/k.html>.

Instructor Intellectual Property

Course materials created by instructors (including course outlines, presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may **NOT** be reproduced, redistributed or copied without the explicit consent of the professor. **The posting of course materials to third party websites such as note-sharing sites without permission is prohibited.** Sharing of extracts of these course materials with other students enrolled in the course **at the same time** may be allowed under fair dealing.

Academic Accommodations

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The Student Accommodations policy is available at <https://ucalgary.ca/student-services/access/prospective-students/academic-accommodations>. Students needing an accommodation based on disability or medical concerns should contact Student Accessibility Services (SAS) in accordance with the Procedure for Accommodations for Students with Disabilities (<https://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities.pdf>). SAS will process the request and issue letters of accommodations to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/.

Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to Dr. Ebba Kurz (kurz@ucalgary.ca), Associate Dean (Undergraduate Health and Science Education).

Academic Misconduct

The University of Calgary is committed to the highest standards of academic integrity and honesty. The University of Calgary has created rules to govern all its members regarding the creation of knowledge and the demonstration of knowledge having been learned.

Academic Misconduct refers to student behaviour that compromises proper assessment of a student's academic activities and includes (but is not limited to): cheating, fabrication, falsification, plagiarism, unauthorized assistance, failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses, and failure to comply with exam regulations applied by the Registrar. **It also includes using of third party websites/services to access past/current course material, essay/assignment writing services, or real-time assistance in completing assessments, seeking answers to assessment questions and similar, whether paid, bartered or unpaid.**

For information of the Student Academic Misconduct Policy and Procedures, please visit; <https://ucalgary.ca/policies/files/policies/student-academic-misconduct-policy.pdf>
<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-procedure.pdf>

Additional information is available on the Academic Integrity website at: <https://ucalgary.ca/student-services/student-success/learning/academic-integrity>.

Recording of Lectures

Audio or video recording of lectures (or similar) is prohibited except where explicit permission has been received from the instructor.

Freedom of Information and Protection of Privacy Act

Student information will be collected in accordance with typical (or usual) classroom practice. Students' assignments will be accessible only by the authorized course faculty. Private information related to the individual student is treated with the utmost regard by the faculty at the University of Calgary

Appeals

If there is a concern with the course, academic matter or a grade, first communicate with the instructor. If these concerns cannot be resolved, students can proceed with an academic appeal, as per Section I of the University Calendar. Students must follow the official reappraisal/appeal process and may contact the Student Ombuds' Office (<http://www.ucalgary.ca/ombuds>) for assistance with this and with any other academic concerns, including academic and non-academic misconduct. Students should be aware that concerns about graded term work may only be initiated **within 10 business days** of first being notified of the grade. <https://www.ucalgary.ca/pubs/calendar/current/i-2.html>

Sexual and Gender-Based Violence Policy

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. The University of Calgary's sexual violence policy guides us in how we respond to incidents of sexual violence, including supports available to those who have experienced or witnessed sexual violence, or those who are alleged to have committed sexual violence. It provides clear response procedures and timelines, defines complex concepts, and addresses incidents that occur off-campus in certain circumstances. Please see the policy available at <https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>

Resources for Support of Student Learning, Success, Safety and Wellness

Student Success Centre	http://www.ucalgary.ca/ssc/
Student Wellness Centre	http://www.ucalgary.ca/wellnesscentre/
Student Advocacy and Wellness Hub (CSM)	https://cumming.ucalgary.ca/student-advocacy-wellness-hub/home
Distress Centre	http://www.distresscentre.com/
Library Resources	http://library.ucalgary.ca

Wellness and Mental Health Resources

The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the excellent mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (<https://www.ucalgary.ca/wellnesscentre/services/mental-health-services>) and the Campus Mental Health Strategy (<http://www.ucalgary.ca/mentalhealth/>).

Student Ombuds' Office

The Student Ombuds' Office supports and provides a safe, neutral space for students. For more information, please visit www.ucalgary.ca/ombuds/ or email ombuds@ucalgary.ca

BHSc Student Faculty Liaison Committee (SFLC)

The BHSc SFLC, with elected representatives from all majors, serves to raise issues of interest to BHSc students to the program administration, including items pertaining to curriculum, scheduling and events. A list of current representatives can be found on the BHSc website.

Student Union (SU) Information

The SU Vice-President Academic can be reached at (403) 220-3911 or suvpaca@ucalgary.ca; the SU representatives for the Cumming School of Medicine can be reached at medrep1@su.ucalgary.ca or medrep2@su.ucalgary.ca.

Student Success Centre

The Student Success Centre provides services and programs to ensure students can make the most of their time at the University of Calgary. Our advisors, learning support staff, and writing support staff assist students in enhancing their skills and achieving their academic goals. They provide tailored learning support and advising programs, as well as one-on-one services, free of charge to all undergraduate and graduate students. For more information visit: <https://www.ucalgary.ca/student-services/student-success>

Emergency Evacuation/Assembly Points

As part of the University of Calgary Emergency Evacuation plan, students, faculty, and staff should locate the closest Assembly Point in case of Fire Alarm. Safety signage is posted throughout the campus showing the locations and the possible route to these locations. All students, faculty, and staff are expected to promptly make their way to the nearest Assembly Point if the Fire Alarm is activated. No one is to return into campus facilities until an all clear is given to the warden in charge of the Assembly Area. For more information, see <https://www.ucalgary.ca/emergencyplan/building-evacuation/assembly-points>

Safewalk

Campus security will escort individuals, day or night, anywhere on campus (including McMahon Stadium, Health Sciences Centre, Student Family Housing, the Alberta Children's Hospital and the University LRT station). Call 403-220-5333 or visit <http://www.ucalgary.ca/security/safewalk>. Use any campus phone, emergency phone or the yellow phone located at most parking lot pay booths. Please ensure your personal safety by taking advantage of this service.

Class Schedule

The following is a list of topics for class, associated readings, and assignment / exam due dates. Please note that unforeseen circumstances may cause changes to the schedule with respect to the timing of topics and readings. Students will be notified of all changes in a timely manner by way of email and D2L announcements. The exam dates are firm and will not be altered.

9/6/2021	Introduction to meiosis and recombination, Page and Hawley 2003 (Mains)
9/8/2021	Worm hermaphrodite genetics, Corsi et al 2015 (Mains) G801E
9/13/2021	Genes are on chromosomes and nondisjunction, Bridges 1916, part I (Mains)
9/15/2021	Genes are on chromosomes, Bridges 1916, part II. Inversions and nondisjunction, Sturtevant and Beadle 1936, part I (Mains)
9/20/2021	Inversions and nondisjunction, part II (Mains)
9/22/2021	Trivalent formation and secondary nondisjunction. Worm nondisjunction in brief. Cooper 1948, Xiang 2006, Hodgkin 1979 (Mains)
9/27/2021	Human cytogenetics and rearrangements, Feuk et al. 2006 (Argiropoulos)
9/29/2021	Yeast genetics (Mains)
10/4/2021	Mutation, eugenics and society, Muller 1932 (Mains)
10/6/2021	Human dominant mutations, Wilkie 1994 (Parboosingh)
10/11/2021	Dominant mutations and genetic redundancy, Park and Horvitz 1986, Herskowitz 1988 (Mains)
10/13/2021	Student talks
10/18/2021	Student talks
10/20/2021	Student talks G801E
10/25/2021	Student talks?
10/27/2021	Reverse genetics: RNAi, morpholinos, genome editing, Fire et al. 1998, Wei et al. 2013 (Li/Huang)
11/1/2021	Genetic screens – fish (Huang)
11/3/2021	Genetic pathways, epistasis and worm sex determination, Roth et al. 2009 (Mains). Take home quiz part 1 handed out, due 11/15
11/8/2021	<i>Fall term break</i>
11/10/2021	<i>Fall term break</i>
11/15/2021	Take home quiz part 1 class discussion. Take home quiz part 2 handed out, due 11/19
11/17/2021	Genetic screens – flies (Grewal) G801E
11/22/2021	Mouse knockout technology (Yang)
11/24/2021	Mammalian sex determination (Argiropoulos)
11/29/2021	Student talks

12/1/2021	Student talks
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12/6/2021	Student talks
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Student papers are due on staggered dates, up to three days after the oral presentation.