



BIOL 405 – ADVANCED GENETICS (FALL 2025)

Course Instructor: Dr. Christopher Somers
chris.somers@uregina.ca
Office: RIC 327
Office phone: 306-585-4850

Lectures: Mon, Wed, Fri 10:30-11:20 in LB 235 (STARTS *September 3rd*).

Office hours: Please email the Instructor to set up an appointment or try dropping by. If my door is open, I am usually able to meet.

Course description: *Advanced Genetics* will examine the current state of the field of human genetics and explore key concepts, technologies, and applications. Topics will range widely from recent advances in our understanding of human evolution, to medical genetics, genomics, and the epigenome. The course will draw extensively on recent primary literature published in peer-reviewed journals. This course is designed for advanced students of genetics and will be presented in a non-traditional format with a combination of lectures and student presentations / peer-directed learning. The course will consist of 3 credit hours.

Learning outcomes:

1. Understand approaches to undertaking modern genetics studies.
2. Demonstrate a sound knowledge of the link between genotype and phenotype.
3. Understand the structure and content of recent scientific papers.
4. Demonstrate applied knowledge regarding genetics and human biology.
5. Wield biological and ethical information to evaluate societal relevance of genetics.

Prerequisites: BIOL 205, 305

Textbook: There is no textbook for Biol 405. Case studies will be assigned from recently published scientific journal articles, and learning resources will be provided in the lecture as needed.

GRADING

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| 1. <i>Assignments</i> – approximately weekly case study reports | (8 x 8%) | 64 % |
| 2. <i>Presentation</i> – assigned case study presented to class | | 11 % |
| 3. <i>Term quiz</i> – all course content | | 20 % |
| 4. <i>Participation</i> – engagement in class discussions | | 5% |

Note: grades posted on UR Courses for assignments and quizzes are unofficial and subject to review/approval. Course grades for all students are calculated using the same components and a common rubric, and therefore grades of individual students cannot be arbitrarily changed by the instructor. A passing grade for the course is 50%.

****Mandatory Course Components**: (1) case study presentation; (2) at least 4 written case study reports; (3) term quiz. These minimum components are required to pass the course and are mandatory. A student who does not complete these components will receive a final grade of "NP".

ASSIGNMENTS

1) Case study reports (64%): First report due September 12, 2025. Students will prepare short summary reports based on case studies covered in class. **Everyone should complete assignment #1 on GWAS to begin.** We will cover more than 10 case studies in the course; after GWAS, students should submit an additional 7 assignments over the semester, each worth 8% (total = 8 assignments, 64%). The summary reports are designed to generate understanding of the material through self-study, and also to provide practice with written communication about genetics. Summaries are due before class the day the topic is to be discussed; late assignments will not be accepted. *You are responsible for choosing which summaries you write and ensuring a total of 7 reports are submitted after the first one.* Summary reports will follow a strict format based on answering the questions listed here:

- 1) What is the background for the work, and what rationale is provided for the current study? 3-4 sentences.
- 2) What is the big-picture study design, and how does this provide the authors with the ability to answer their research question / test their hypothesis? 3-4 sentences; focus on the big-picture, such as sample groups and comparisons.
- 3) What is the major genetics technique used? 3-4 sentences; focus on key aspects of the actual technology, such as whole exome sequencing using a capture-hybridization technique followed by large-scale DNA sequencing on an Illumina platform.
- 4) What are the 2 most important take-home message from the work? 2 sentences, 1 for each major message.
- 5) What is one major strength, and one potential weakness of the study?
- 6) In your own words, briefly explain why you think this particular reading was assigned. In other words, what major genetics and/or societal concept does it illustrate? 3-4 sentences.

NOTE: Summary reports **must not exceed 2 pages in total length**. They should be written in paragraph form with full sentences and some thought put into the presentation. Practice writing succinctly and making the most efficient and impactful use of the written word. Communication skills are critical for any field, so distilling things down in this way is very valuable to practice.

2) Case study presentations (11%): Work in pairs. Students will guide the rest of the group through an assigned reading. Our objective is for peer-directed learning, so presenters should study the paper sufficiently to walk the class through all of its major components. Remember that everybody will have read the paper and written a short summary report, so they will be familiar with the work. **No formal presentation with visual aids is required** (although you can choose to do so); rather, the presenters will simply talk us through the work and highlight key aspects of the assigned paper. Presenters should prepare to cover: (a) background and rationale; (b) objectives; (c) major study design and methods; (d) major results; and (e) major conclusions and take-home messages; (f) societal and ethical implications; (g) their opinion on the study (quality and impact). The rest of the class should be prepared to engage in discussion about the case study.

QUIZZES AND EXAMS

1. *Term Quiz (20%)* – Lecture content of the course in lecture period, one week prior to the end of classes. This quiz will cover major aspects of material learned in the course. The quiz will take place **in-person on November 28, 2025 during the lecture period.**
2. *Final Exam* – Biology 405 does not have a final exam.

Late assignments/missed exam policy: Late assignments will be assigned a grade of zero and not receive feedback, unless a valid reason is established and arrangements made with the instructor. If you miss a test, contact the Instructor immediately to make alternative arrangements.

Attendance policy: Attendance at lectures is expected for all students; a portion of the grade is assigned for participation in class discussions. However, attendance is not formally taken or tracked.

Guideline for Class Activities

This course is designed to be flexible and the topics or items covered may vary from this list.

Sept 3	First day of Biol 405 classes
Sept 12	Case Study 1 <u>GWAS</u> (instructor)
Sept 19	Case Study 2 <u>WES</u> (student group)
Sept 26	Case Study 3 <u>WGS</u> (student group)
Oct 3	Case Study 4 <u>CNV</u> (student group)
Oct 10	Case Study 5 <u>Ancient DNA</u> (student group)
Oct 17	Case Study 6 <u>Non-invasive sampling – prenatal</u> (student group)
Oct 24	Case Study 7 <u>Non-invasive sampling – cancer</u> (student group)
Oct 31	Case Study 8 <u>Gene Expression</u> (student group)
Nov 7	Case Study 9 <u>Epigenetics</u> (student group)
Nov 10-14	FALL BREAK
Nov 21	Case Study 10 <u>Gene Editing</u> (instructor)
Nov 28	Term Quiz
Dec 5	Case Study 11 <u>Cloning</u> (instructor)

Academic integrity: Academic integrity requires students be honest. Assignments and exams are to help students learn; grades show how fully this goal is attained. Thus, all work and grades should result from a student's own understanding and effort. Acts of academic misconduct violate academic integrity, and are considered serious offences by the University. Examples include, but are not limited to, cheating on tests or exams, plagiarizing, copying from others, falsifying lab results, etc. Instances of academic misconduct will be reported to the Associate Dean Academic for investigation. Full details are provided in the [Undergraduate academic calendar](#). Students are encouraged to understand your obligations as a student, as well as your rights.

In this course, **you are not permitted to use generative artificial intelligence (AI) programs** in your assignments or exams. Any work suspected of using generative AI will be reported for investigation of academic misconduct.

Accommodations: The Centre for Student Accessibility upholds the University's commitment to a diverse and inclusive learning environment by providing services and supports for students based on disability, religion, family status, and gender identity. Students who require these services are encouraged to contact the Centre for Student Accessibility to discuss the possibility of academic accommodations and other supports as early as possible. For further information, please email accessibility@uregina.ca.