

Course Outline

BIOL361 Molecular Genetics and Genomics, Spring 2022

Instructors: Dr. Ryan Gawryluk Dr. Gregory Owens
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Lectures: 8:30 to 9:50 am Mondays and Thursdays in Elliot Building 167

Office hours: Weekly Zoom hour (TBD)

Zoom Meeting ID: 878 2495 6738; Passcode: BIOL361

Land Acknowledgement:

We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the University of Victoria stands, and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day. We are thankful to be able to learn together on this land, and strive to make the world a better place.

Diversity and Inclusion:

We welcome everyone to learn in this course and we respect every human being, including all people from all ethnic backgrounds, religious beliefs, sexual orientations, genders, socio-economic backgrounds and abilities.

Course Description:

Naturally occurring and induced genetic mutations leading to phenotypic variation within- and among-species in a diversity of eukaryotic taxa, including yeasts, plants and vertebrates. Theory and mechanisms in regulation of transcription and translation, genome structure and mobile genetic elements, and functional genomics.

Attendance

This course is meant to be in-person (except for January 10-24, 2022) but given the pandemic situation we encourage you to stay home if you have any Covid symptoms or known exposure. All lectures will be recorded and available on echo360, and all participation activities will also be available remotely.

Evaluation

One hundred (100) marks in total:

There will be three exams, each worth 25 marks, for a total of 75 marks. All exams are non-cumulative and will only cover the course material since the previous exam. The two midterm exams will take place via BrightSpace, and the final exam will take place in the scheduled exam slot.

There will be one group assignment worth 20 marks. Detailed assignment instructions will be handed out in early February. It will involve reading primary literature and summarizing how genomic technologies have facilitated understanding of a topic in biology.

There will be 5 marks for participation. Marks will be allotted for asking and answering questions in the BrightSpace forum (2 marks), and completing three short assigned 'reflections' about selected topics in the class prior to exams (3 marks).

Notes on exams:

Exams are designed for a duration of 60 minutes, but you will get an additional 20 minutes grace period, during which you can still submit your quiz without any penalty (*i.e.*, technically, you have 60 minutes per quiz, but practically you do have 80 minutes). The grace period is to accommodate any technical problems that may occur.

Exams are open-book, and you are allowed to use any course-based or other non-human resource during the exam, but you must not communicate with anyone during the exam, except the invigilator (instructors will be available on Zoom during exams. Note that exams are timed and that you will not have sufficient time to learn the tested material during the exam.

To be excused from an exam, you must provide an excusable rationale to the instructor within a week of the exam, but no doctor's notes are necessary during the pandemic. Deferred exams will occur the following week for excused absences.

Academic Integrity Statement

Students must abide by academic regulations as set out in the university calendar. They must observe standards of scholarly integrity with regards to plagiarism and cheating. Please read the definitions, watch the tragi-comic video and look at the other information available at the following link

<https://www.uvic.ca/current-students/home/academics/academic-integrity/index.php>

Grading scheme

A+ (90%-100%), A (85-89.75%), A- (80-84.75%), B+ (77-79.75), B (73- 76.75%), B- (70-72.75%), C+ (65-69.75%), C (60-64.75%), D (50-59.75%), F (<50%)

Resources

Short summaries, lectures, and complete references of key papers will be uploaded to BrightSpace.

Tentative course schedule

Week 1 (Jan 10- 14)

Jan 10: Introduction to the course and outline of material [RG, GO]

Jan 13: Qualitative and quantitative genetic loci: Sticklebacks with a no-pelvis phenotypes. [RG]

Week 2 (Jan 17 - 21)

Jan 17: Mapping Pitx1: the transcription factor responsible for pelvis phenotypic variation [RG]

Jan 20: Molecular basis of convergent evolution of hind-limb reduction in animals. [RG]

Week 3 (Jan 24 - 28)

Jan 24: Whole genome association genetics and human diseases: Clubfoot disease. [RG]

Jan 27: Whole genome association genetics and human diseases: Anemia, BCL11 and fetal hemoglobin (HbF). [RG]

Week 4 (Jan 31 – Feb 04)

Jan 31: Whole genome sequencing technology and methods. [GO]

Feb 03: Putting it all together, how to assemble a whole genome. [GO]

Week 5 (Feb 07 - 11)

Assignment handed out.

Feb 07: Eukaryotic genomes – an introduction to transposable elements [RG]

Feb 10: **Exam 1**

Week 6 (Feb 14 - 18)

Feb 14: Transposable elements shape genomes and influence evolution I [RG]

Feb 18: Transposable elements shape genomes and influence evolution II [RG]

Week 7 (Feb 21 – 25)

Reading Break: no lectures

Week 8 (Feb 28 – Mar 04)

Feb 28: Mammalian tumors and their causes: alterations of cancer-critical genes [RG]

Mar 03: Genomics (and transcriptomics) of mammalian tumor formation [RG]

Week 9 (Mar 07 - 11)

Mar 03: Metagenomics: high throughput genomics of the uncultured majority [RG]

Mar 10: Diverse functions of RNAs in transcription and translation [RG]

Week 10 (Mar 14 – 18)

Mar 14: CRISPR and genome editing [RG]

Mar 17: Synthetic Biology (Guest Lecture)

Week 11 (Mar 21 - 25)

Mar 21: **Exam 2**

Mar 24: How to measure genetic variation using sequencing [GO]

Week 12 (Mar 28 – Apr 1)

Mar 28: Conservation and population genetics [GO]

Mar 31: Conservation and population genetics [GO]

Week 13 (Apr 04 – 08)

Apr 04: Phylogenetics and phylogenomics [GO]

Apr 07: Phylogenetics and phylogenomics [GO]

Exam 3: In scheduled exam slot

UVic is committed to promoting, providing and protecting a supportive and safe learning and working environment for all of its members. Your health and mental well-being are important for succeeding in this course, so please take advantage of UVic resources. We want you to walk out of this course and live a long happy life!

- **Support Connect:** 24/7 help by phone or online

<https://www.uvic.ca/student-wellness/contacts/emergency-contacts/index.php#ipn-supportconnect-24-7-help>

- **Student Wellness Centre** to support students' mental, physical and spiritual health

<https://www.uvic.ca/student-wellness/>

- **Centre for Accessible Learning** - The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations: <https://www.uvic.ca/services/cal/>. The sooner you let us know your needs, the quicker we can assist you in achieving your learning goals in this course.

- **Office of Indigenous Academic and Community Engagement (IACE)** has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty and administration in Indigenous ways of knowing and being. <https://www.uvic.ca/services/indigenous/students/index.php>

- **Office of Student life:** student conduct, Student mental health, Sexualized violence awareness: <https://www.uvic.ca/services/studentlife/index.php>

Important Dates

The UVic calendar contains a more complete list of important dates; please consult it for more detail (<https://www.uvic.ca/calendar/dates/>).

Monday, January 10	First BIOL361 lecture
Wednesday, January 26	Last day for adding classes
Sunday, January 30	Last day for 100% reduction of tuition fees for standard first-term and full-year courses
Thursday, February 10	Exam 1
Sunday, February 13	Last day for 50% reduction in tuition fees for standard courses. 100% of tuition fees will be assessed for courses dropped after this date.
Mon-Fri, February 21-25	Reading break, no classes
Monday, February 28	Last day for withdrawing from courses without penalty of failure

Monday, March 21

Exam 2

Thursday, April 7

Last BIOL361 lecture

During exam period

BIOL361 Final Exam