

UNIVERSITY OF VICTORIA

## Biology 362 – PRACTICAL SKILLS IN GENOMICS

### COURSE OUTLINE - Spring 2024

Lecture: Wed, 1:30-2:20PM, ELL 161; Lab: Thu, 2:30-5:20 PM, CUN116 or CLE A103

Course Instructor: **Dr. Ryan Gawryluk**  
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Office hours by inquiry; please email to make an appointment.

**Course Description:** An introduction to advanced experimental techniques in molecular biology and genomics. Course includes nucleic acid (DNA) isolation, polymerase chain reaction (PCR), DNA quality control, next generation DNA sequencing, computer-based analysis of large-scale nucleotide sequence data such as DNA sequence assembly and mapping, BLAST searches, multiple sequence alignment, and phylogenetic analyses. Student-collected data from one or more lab projects will be used to develop skills in contemporary genomics research and in scientific manuscript writing.

#### Intended Learning Outcomes:

- Students will understand the design of microbiome and other genomics research projects.
- Students will gain proficiency in standard molecular biological laboratory techniques.
- Students will acquire basic genomic data analysis skills.
- Students will be able to prepare an authentic scientific manuscript by presenting their findings in text and other formats, accompanied by iterative feedback from the instructor(s).

**Land Acknowledgement:** We acknowledge and respect the ləkʷəŋən 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.

DATE	LECT/LAB	TITLE (tentative)
Jan	10-W Lec.1.	Course introduction
	11-Th Lab 1	<b>Introduction / Experimental Design / Safety</b> <i>Assignment 1 due: Project proposal</i>
	17-W Lec. 2.	Sampling details
	18-Th Lab 2	<b>Student organized sampling</b>
	24-W Lec. 3.	Nucleic acid extraction methods
Feb	25-Th Lab 3	<b>DNA extraction I: extraction</b>
	31-W Lec. 4.	Introduction to metagenomics
	1-Th Lab 4	<b>DNA extraction II: sample cleanup</b>
	7-W Lec 5.	Polymerase Chain Reaction (PCR) techniques
	8-Th Lab 5	<b>DNA quality control: Nanodrop, Qubit &amp; PCR</b>
	14-W Lec.6	NGS: Background and applications
	15-Th Lab 6	<b>Gel electrophoresis; Tutorial: How to write an introduction</b> <i>Assignment 2 due: Annotated bibliography of five sources</i>
	21-W and 22-Th	<i>Reading Break: no lecture, no lab</i>
	28-W Lec 7	Illumina DNA sequencing I (library production)
	29-Th Lab 7	<b>Illumina library production</b> <i>Assignment 3 due: 2-3 page Introduction</i>
Mar	6-W Lec. 8	Illumina DNA sequencing II (quality control)
	7-Th Lab 8	<b>TBD; Tutorial: Scientific figures</b> <i>Assignment 4 due: Figure for Nanodrop, Qubit</i>
	13-W Lec. 9	Next generation DNA sequencing III (sequencing proper)
	14-Th Lab 9	<b>MiSeq DNA sequencing. Tutorial: Material and Methods writing</b>
	20-W Lec. 10	DNA sequence data formats and raw data manipulations
	21-Th Lab 10	<b>Sequence analysis: Data quality control and cleanup</b> <i>Assignment 5 due: Experimental Materials + Methods (M+M)</i>
Apr	27-W Lec. 11	Microbial Diversity
	28-Th Lab 11	<b>Clustering of Operational Taxonomic Units (OTUs)</b>
	3-W Lec. 12	Assigning taxonomy; phylogenetics
	4-Th Lab 12	<b>Quantification and identification of OTUs; Phylogeny</b>
	11-Th 18-Th	<i>Assignment 6 due: M+M for bioinformatics, results</i> <b>Final paper due*</b>

<b>Requirements:</b>	Assignments (5)	50% (best 5 out of 6 counted, 10% each)
	<b>Final paper*</b>	25%
	Practical Skills/Participation	5%
	Quizzes (10)	20% (each worth 2%)

**Grading system:** Percentages converted to letter grades

A+ 90-100	A 85-89	A- 80-84	B+ 77-79	B 73-76
B- 70-72	C+ 65-69	C 60-64	D 50-59	F 0-49

\*The final paper is a course requirement. Also, students may miss no more than two laboratories to pass the course (see below).

Please note – you need to provide an acceptable rationale (*e.g.*, health problems) to be granted an extension for assignment due dates. We assign an incomplete (not a zero) for any elements missed with an excuse, and your final mark will be calculated on the basis of the other completed components of the course, and you will not incur any penalty.

Students must abide by academic regulations as set out in the University of Victoria 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 this [link](#).

The use of generative AI tools, such as ChatGPT or GrammarlyGO, are not allowed for assignments or quizzes. We reserve the right to use anti-plagiarism or AI detection software.

Students must abide to current COVID19 regulations, please check <https://www.uvic.ca/return-to-campus>.

**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.**

**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/](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/>

Wednesday, January 10	First BIOL362 lecture
Thursday, January 11	First BIOL362 lab
Friday, January 31	Last day for paying second term fees without penalty
Sunday, February 9	Last day for 50% reduction in tuition fees for standard courses.
Mon-Fri, February 17-21	Reading break, no classes
Thursday, February 29	Last day for withdrawing from courses without penalty of failure
Wednesday, April 3	Last BIOL362 lecture
Thursday, April 4	Last BIOL362 lab