

*This syllabus is a general representation of the course as previously offered and is subject to change.*

## **BIOL 437 – Laboratory in Animal Cell Molecular Biology**

General Course Syllabus (as of July 2019)

### **About the Course:**

**Course Description:** A course on the use of molecular biology techniques to explore problems in animal developmental biology.

**Course Format:** Laboratory. Time commitment once a week, and additional time also required sometimes the day before or the day after.

**Credits:** 3

**Prerequisites:** All of BIOL 331, BIOL 335 and one of BIOL 201, BIOC 302, BIOC 303. (Permission of the department head is also required.)

### **Course Learning Objectives:**

This laboratory course is a theoretical and practical survey of a wide range of molecular biology techniques, from general cloning techniques to advances in next generation sequencing, and with an emphasis on being able to navigate methodologies involving DNA, RNA, and proteins.

By the end of the course, students should:

- attain a degree of comfort with these techniques, and
- be prepared to adapt to a variety of analysis and troubleshooting tasks associated with the data obtained.

### **Textbooks and Additional Resources:**

Students will be asked to pay a \$20 fee on the first day to obtain required course materials. The fee covers:

- hardcopy version of the lab manual,
- lab lecture notes, and
- a bound notebook.

### **Evaluation:**

<b>Assessment</b>	<b>Weight</b>
Lab Book	40%
Papers (two during the term)	40%
Quizzes	20%

**\*Up to minus 5% penalty mark for general technique:** This is not intended to

penalize students for not producing perfect data or having varying levels of experience. The goal of the course is to turn students into efficient researchers, so a potential 5% penalty will be applied should the following happen: nothing ever works and the student doesn't demonstrate any constructive troubleshooting, the student is almost always the last to finish the experiment, is unreliable to other classmates, and/or is almost never prepared.

### **Details on Assessments:**

#### **LAB NOTEBOOK**

Lab books will be marked twice (sometime in the middle and sometime at the end) in the specified format. Instructions will be provided for students to keep a lab book under the context of an industrial or company format. Attention to legibility and detail are important since the business aspect of employment holds them accountable for ANY results they obtain. Therefore, it is simply in their best interest to make lab notes as clear as possible.

Lab books will be marked on the basis on how easy it is for the instructor to follow the student's progress and on interpretive skills in dealing with the data. A book that is descriptively clear will be awarded approximately 75%. The other 25% is largely based on the level of interpretation.

**Students will NOT have to write lab reports.**

#### **LITERATURE ASSIGNMENTS:**

- **FIRST PAPER: (Draft & Final) – 20% of total grade**

For this assignment, students will work as a pair (or students can ask the instructor if they prefer to work solo). Essentially, students will be asked to author a fake scientific paper that presents molecular biology data – this should also include high through-put-omic/next gen examples. Not only that, the paper will present credible looking data on an otherwise incredible phenomenon or pop culture topic (in other words, it will tread the fine line of being believable yet obviously unbelievable). Examples of such themes include working within Star Wars, Harry Potter, Star Trek, Superhero, Anime, Pokemon type scenarios, but students are also welcome to suggest others.

For the draft, a working draft with figures is expected and students will present their paper to the class (journal club style!). Any issues will be covered during the presentations, so that the final paper is good to go.

Marks will be based on scientific content (i.e. how convincing are the conclusions, and most importantly, the experimental narrative in the paper), how good/authentic it looks (i.e. does it look like a real paper, as well as writing and grammar all checking out), and creativity in the repercussions of the science (i.e. some scientific twist that makes the paper all the more interesting). Formatting guidelines will be given in class. Length is

flexible, but should have approximately 5 pages (single spaced) of text per person involved (not including figures and references).

- SECOND PAPER – 20% of total grade.

Students will be required to author **one** paper for the course to discuss a science topic within a layman setting. In other words, the piece in question should tackle some element of science (technical or creative or opinion piece) that someone in the first year sciences can comprehend. It is becoming necessary and a responsible need for scientists to step back and look at their work from a bigger picture perspective, and ideally, the intent of this paper is to give students an opportunity to explore that theme.

**The topic** is open for the student's choosing as long as there is a link to the sciences. Examples of previous pieces have often appeared in *The Science Creative Quarterly* (<http://scq.ubc.ca>). **The length of the paper** should hover around 1500 to 2000 words (about 3 - 4 pages single spaced). Marks will be based on content (amount of material, research put in, factual mistakes, etc); writing (grammar, diction, transitions, etc); and accessibility (i.e. too technical for the Grade 12, 1<sup>st</sup> year undergraduate student level).

**Notes on Due Dates:** *Students will lose 10% of their paper grade each day it is late.*

## QUIZZES

Quite frequent (> 6 of them) will occur in the first 10 minutes of class, and primarily designed to get students to read the manual beforehand, as well as show up on time.

## Schedule of Labs

### CONTENTS BY STREAM:

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Lab A:	Polymerase Chain Reaction
Lab B:	Cloning Techniques (Including Restriction Digests, Purification Kits, Cip Assays, Ligations, Transformation, Plasmid Preps)
Lab C:	Rna Work: Isolation/Purification And Reverse Transcriptase Assay, Real Time Pcr
Lab D:	Detection Of Protein Expression From Cloned Genes By Western Blotting
Lab E:	2d Protein Gel Electrophoresis
Lab NGS:	Next Gen Sequencing

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## Sample Schedule from 2018W1:

- WEEK 1:** Course introduction + lecture
- WEEK 2:** LAB A: DNA fingerprint assay (polymerase chain reaction)
- WEEK 3:** LAB B1/B2: Ligations, transformation procedures  
(+)\* LAB B3: Plate analysis and culture start for plasmid preps
- WEEK 4:** LAB B4: Mini Plasmid preps
- WEEK 5:** LAB NGS1: Library prep  
LAB NGS2: OneTouch2, ISP Prep  
(+)\* LAB NGS2: Finish OneTouch2 step
- WEEK 6:** LAB NGS3: ISP check. Enrichment  
LAB NGS4: Sequencing run  
**First draft journal club of 1<sup>st</sup> paper due**
- WEEK 7:** LAB C1: Total RNA prep  
LAB C2: Reverse Transcriptase + real time PCR  
**Lab book PART I due**
- WEEK 8:** LAB D1/D2: PAGE pouring and running protein samples  
LAB D2: Transfer of proteins  
**Paper 1 due**
- WEEK 9:** (+)\* LAB E1: 2D gel start. Hydration of IPG strips  
LAB E2: 2D gel: isoelectric focusing  
LAB E3: Western blot analysis
- WEEK 10:** LAB E3/E4/E5: 2D gel – staining 1<sup>st</sup> dimension. Equilibration of IPG strips.  
Prepping 2<sup>nd</sup> dimension  
LAB E6: 2D gel staining
- WEEK 11:** Pick up 2D gel data.  
**Lab Book Part II and paper 2 due**

\* Note that additional lab time is allotted in Week 3, Week 5, and Week 9. The lab will be open those days from 10am to noon, and 1pm for the required procedures.

## **University Policies:**

*UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.*

*UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.*

*UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.*

*UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.*

*Details of the policies and how to access support are available on [the UBC Senate website](#).*