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

BIOL 140 – Laboratory Investigations in Life Science

General Course Syllabus (as of June 2019)

About the Course:

Course Description: Guided experimental investigations of biological questions. Students will participate in the scientific process, emulating as closely as possible the fundamental steps research scientists follow.

Course Format: BIOL 140 is a 2-credit, laboratory-only course that meets for 12 weeks for 3 hours per session. It is offered in winter Term 1 and 2, as well as in Summer Session at UBC Vancouver.

Credits: 2
Pre-requisites: One of BIOL 11, BIOL 12, BIOL 111

Teaching Approach in BIOL 140:
Students will practice thinking like scientists, which involves trying to answer questions for which there may be no clear answers. Attempting to answer interesting questions is the essence of biological science. Biology 140 instructors are trained to help students explore means of finding evidence to support or refute their predictions. They facilitate student learning by providing instructions for activities and guiding class discussions. The workbook instructions and questions as well as on-line materials further guide students through the scientific processes of observation, developing scientific questions, and designing an experiment. Working in research teams, students will develop communication and organizational skills. Team members are expected to contribute to the discovery and integration of observations, generated data, and published information. Effective team work enhances the generation of new scientific knowledge.

Course Learning Objectives:

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

- Participate in the **process of science** and demonstrate scientific thinking.
- Acquire, organize, evaluate and integrate **information about a biological system.**
- Practice **scientific skills,** by making observations, recording, analyzing and interpreting data, and using lab equipment as appropriate.
- **Communicate** as appropriate for the biological sciences.
- **Work effectively as part of a team** to design, implement and communicate the results of a scientific experiment.

Textbooks and Additional Resources:

1. **Required text:** the Biology 140 Workbook is required. Each week students will complete all exercises and answer the questions within the workbook. The completion of work will be checked and stamped.

2. **Laptop computers:** they may be required in lab for some of the activities. At least one member in each research group will need to bring one to lab.

3. **Recommended reference text (not essential):** Freeman, S., Quillin, K., Allison, L., Black, M., Podgorski, G., Taylor, E., Carmichael, J., Harrington, M. and Sharp, J. 2019. Biological science, 3rd Canadian Edition custom edition for UBC 2018-19 Pearson Education Inc., San Francisco, CA. This is the same text used for Biology 121 and can be a useful reference for BIOL140, but it is not essential for this course. Older editions are fine.

4. **Biology 140 Canvas site:** on the web site are course materials, quizzes, announcements and other relevant information. Go to http://www.canvas.ubc.ca/ and login with a CWL.

Evaluation:

Biology 140 grades will be calculated as follows:

Assessment	**Weight**
Lab experiment: ○ Research paper: Introduction section (individual, 12%) Methods & Results section (group, 6%) Discussion section (individual, 22%) ○ Oral presentation of experimental research (group, 5%)	45%
Field study: Informal lab meeting presentation (group)	5%
Assignments: ○ Five online quizzes (individual, total 5%) ○ Scientific Explanation assignment (individual, 6%) ○ Experiment Plan worksheet (group, 2%)	13%
Participation: ○ Completion of each lab (5% total) ○ Peer evaluation of contribution (2%)	7%
Final exam	30%

Note that a passing mark (50% or above) on the final exam is necessary to pass the course.

Schedule of Topics:

Lab classes meet on a weekly basis in the BIOL 140 lab room, except for the field study (study of intertidal organisms at Tower Beach/Bamfield in fall and summer, and study of terrestrial organisms at Pacific Spirit Park in winter).

Note: The order and delivery of topics may vary between the fall, winter, and summer offerings of BIOL 140. Below is an example from winter (Term 2).

Week	Lab	Assignment
1	*No labs: first week of term students check in and buy workbook*	
2	**Lab 1: Investigations in Biology** 1. Questions in Biology 2. Investigating the effects of abiotic factors on terrestrial organisms 3. Scientific investigation scenarios activity 4. Your research animal	Quiz 1
3	**Lab 2: Gathering and using data as scientific evidence** 1. Measuring behavioural responses of your research animal 2. Constructing a scientific explanation	
4	**Lab 3: Developing a research question and planning your investigation** 1. Group Guidelines 2. Finding and using scientific references 3. Developing your research question -Worksheet	Scientific Explanation assignment Quiz 2
5	**Lab 4: Experiment design** 1. Experimental design critique activity 2. Planning and designing your experiment 3. Preparation of your Introduction Assignment	Quiz 3
6	**Lab 5: Experiment Trial 1** 1. General procedure for experimental Trial 1 2. Evaluating Trial 1 3. Preparation for Trial 2	Introduction assignment
7	**Lab 6: Experiment Trial 2** 1. General procedure for experiment Trial 2 2. Evaluating Trial 2 3. Preparation of Methods and Results Assignment	Quiz 4

8	**Lab 7: 'Discussion' planning and development** 1. Dissecting a Biol 140 Discussion 2. Developing an outline for your discussion 3. Developing your Oral Discussion	Methods and Results assignment
9	**Lab 8: Oral discussion** 1. Oral discussion 2. Incorporating feedback	Oral Discussion assignment
10	**Lab 9: Introduction to discovery-based investigations and preparing for the forest field study** 1. Introduction to discovery-based research 2. Field sampling method 3. Identifying common plant species 4. Additional field data 5. Dealing with the field data	Written Discussion assignment
11	**Lab 10: Forest field study** 1. Sampling at Pacific Spirit Park 2. Questions to consider 3. Lab meeting presentation requirements	Quiz 5
12	**Lab 11: Field study lab meeting** 1. Lab meeting presentations	Field study lab meeting presentation
13	**Lab 12: Scientific investigations in review** 1. Research in a different context 2. Scientific Investigations in review 3. Evaluation (course, instructor, peers) 4. Final exam information	Final exam information will be available in Canvas

Additional Course Policies

1. **Academic requirements:** all students in Biology 140 must have completed Grade 11 or 12 Biology, or BIOL 111. If you have concerns regarding previous course credits or the appropriate prerequisite courses contact the course coordinator or the Biology Office.

2. **Preparatory work:** each lab you will complete some work before lab (watch videos, read information, complete online quizzes) that is designed to prepare you for the lab's activities. Materials are available on Canvas or in your workbook. Quizzes must be completed by 9 pm the day before your lab session.

3. **Assignments:** they are listed in the Course Schedule. Instructions and rubrics for your assignments are included in the workbook. Follow all format requirements. Pay attention to the due dates and additional information provided by your Lab Instructor. Make sure your name and correct lab section are clearly indicated on the top of the first page of every assignment.

4. **Late assignments:** written assignments that are late (not handed in at the beginning of class) will have marks deducted as a penalty. If the assignment is submitted late but on the same day there will be a penalty of -5%. If the assignment is submitted the next day, and for every subsequent day there will be a penalty of -10% per day. If assignments are more than four days late, the maximum deduction will be 40%. No assignments will be accepted once they are returned in any section.

   Late assignments can be emailed to your instructor (this stops the penalty clock), and then a printed original copy of the assignment must be submitted to the designated assignment box within 24 hours. Be sure to indicate that a copy has been emailed to your instructor and that your name and correct lab section are clearly indicated on the top of the first page of your assignment.

5. **Academic integrity:** this is fundamental to learning and research at a university. Students learn from the work of other authors and instructors but when you submit written work as your own you must put these ideas into your own words and indicate the original source of the ideas. Submitting work that is copied from another student or written source is plagiarism. Refer to the information on Plagiarism and Turnitin in the Scientific Conventions section of the workbook.

6. **Missed labs:** It may be possible to make up labs that are missed due to illness or unforeseen circumstances. Contact your lab faculty to determine whether it is appropriate for you to make up the lab in another section. It is only possible to make up the lab in the same week as the lab you have missed. Your lab faculty will give you further instructions on how to arrange another lab section to attend. You are responsible for completing all the work required for each lab. Contact your group members to find out what you missed during your lab class and always check that your lab instructor has received notice that you have completed work done in another lab section.

7. **Laboratory safety:** safety is most important. Read the Safety Rules on the inside cover of the workbook. Although there are no toxic chemicals used in this lab there is NO EATING or DRINKING in the lab. If you need to eat or drink, step outside into the hall. Lab coats and goggles are not required but dress appropriately: closed-toed shoes and clothing that protects and covers your body including your knees when seated (no bare backs, short shorts or short skirts). It is best to avoid loose long sleeves and other clothing that are so loose that they can get caught in equipment or materials.

8. **Lab cleanup:** you are responsible for cleaning up your station and returning any equipment and materials used during the lab. Pace your progress through the lab activities to ensure that you have sufficient time to clean up after each activity. Always replace materials on the trays as you found them at the beginning of lab, unless the instructor directs you to do otherwise. This includes rinsing glassware in warm water (do not use soap) and leaving the glassware to air dry. Be sure to clean your lab bench, and push in your stools before you leave.

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 ae 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.