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

BIOL 439 - Advanced Microscopy Techniques

General Course Syllabus (as of June 2023)

About the Course:

Course Description: BIOL 439 provides conceptual knowledge and framework for imaging techniques covering optical and electron microscopy as well as hands-on experience with the research-grade microscopes at the UBC Bioimaging facility. In the first nine weeks of classes, students learn principles and applications of variety of microscopy techniques through lectures and student presentations, and have hands-on training on the light/fluorescence and confocal microscopy. In the rest of the term, students work on their own project by applying proper imaging techniques to answer research questions.

Course Format:

- Lecture and Laboratory

Credits: 3 credits
Prerequisites: BIOL 200
Co-requisites: One of BIOL 448, BIOL 449, and fourth year standing

This course is also offered as BIOL 539 and is open with permission of the instructor, until enrollment of the course reaches capacity.

Course Learning Objectives:

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

- Explain principles and applications of various microscopy techniques
- Apply their knowledge and microscopy skills to answer their research questions
- Generate both qualitative and quantitative data using the microscopy techniques
- Critically assess microscopy experiments and draw conclusions
- Troubleshoot when encountering minor issues with the imaging techniques

Resources:

All learning materials of this course will be provided on Canvas or accessible online. All readings are available through the library.

Evaluation:

Assessments	Weight
Intellectual contributions (participation in class, lab, and preparation for group discussions)	10%
Student presentation about imaging techniques	20%
Image acquisition and editing exercises	20%
Online quizzes	20%
Final project/Poster presentation	30%

Details on Assessments:

Intellectual contributions
Students are encouraged to interact and discuss the course contents with peers during the class. In-class activities are designed to facilitate the discussion in class, and students also have opportunities to receive feedback from peers for their presentations. Full and engaged participation is expected in class, as the course is open-ended and flexible that allow students to explore and pursue their own interests.

Student presentation about imaging techniques
Each student is assigned one technical topic in the beginning of the course and gives a 15-min talk to peers. The instructor sends students the contents to cover in the presentation, and students are encouraged to gather information from the literatures (technical and review papers about the topic, research papers for application, library course reserved books). The presentation is peer reviewed.

Image acquisition and editing exercises
Students will acquire images during the hands-on session of the light/fluorescence and confocal microscopes in the lab, and use these images to complete image processing/analysis exercises using Fiji/ImageJ software.

Online quizzes
Two online quizzes cover the contents from lectures and student presentations. Questions are designed in two ways: 1) to ensure their understandings of course contents, 2) to challenge their ability to think critically and practice their knowledge and skills in the microscopy experiments. Microscopy experiments described in research papers are used to build short answer questions. These case study questions allow students to assess and interpret the data critically in research context.

Final project/Poster presentation
Students will undergo designing, planning, conducting experiments, interpreting data, making a poster presentation for their own final project. Evaluation is based on: Content, Structure/organization, Layout and design, Presentation skills.

Course Policies:

Academic integrity is essential to the functioning of the University of British Columbia as an institution of higher learning. All UBC students are expected to behave as honest, responsible members of our community and to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic integrity. Cheating on exams or projects, plagiarizing or any other form of academic dishonesty are clear violations of academic integrity and will result in disciplinary action. https://learningcommons.ubc.ca/resource-guides/understand-academic-integrity/

Schedule of Topics:

Week	Assignments and activities
1	Course introduction
2	Introduction to light/fluorescence microscopy
3	Introduction to confocal microscopy
4	Advanced fluorescence microscopy
5	Ethical considerations of digital image manipulation
6	Reading break
7	Introduction to scanning electron microscopy (SEM)
8	Introduction to transmission electron microscopy (TEM)
9	SEM and TEM demos/Working on own project -imaging-
10	Working on own project -imaging-
11	Working on own project -imaging, image processing-
12	Working on own project -image processing and analysis-
13	Working on own project -making a poster-

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.