**CSB 330H1S – TECHNIQUES IN MOLECULAR AND CELL BIOLOGY**

8L, 52P

**This course has a lab fee of $50.**

**Lecturers:**

Prof. J. Mitchell (Team lead) [ja.mitchell@utoronto.ca](mailto:ja.mitchell@utoronto.ca)

Prof S. Lumba [shelley.lumba@utoronto.ca](mailto:shelley.lumba@utoronto.ca)

**Prerequisite:** BIO230H1/BIO255H1, BIO260H1/HMB265H1

**Recommended Preparation:** BCH311H1/CSB349H1/MGY311Y1 taken concurrently

A laboratory course illustrating how modern molecular and cell biology research techniques can be used to answer questions about genes and proteins. Experimental systems include bacteria, yeast, plants, and animal cell lines. The laboratory component offers the opportunity for hands-on exposure to plasmid cloning, PCR, bioinformatics, gene expression analyses, protein-protein interactions, and protein subcellular localization studies. Additional experimental strategies are discussed in lectures and assignments. This course offers the opportunity to develop laboratory skills that will prepare you for future research project courses, summer research projects and work in biological and biomedical research.

This course involves a serious commitment for students.  There are 5 lecture/lab hours per week, and the expectations are that students attend all lectures and labs. Attendance will be taken for every session, and penalties are imposed for missed sessions when the appropriate documentation has not been submitted. Penalties are imposed on both the participation grade and the lab report grades for missed sessions.

There is extensive writing in the assignments for this course.  For example, there are two reports to be written in the style of a primary research paper, and each report is ~1000-2500 words in length.  Please note that all written work will be submitted to Turnitin, and you will be asked to submit the Academic Integrity Checklist with your assignments.  All allegations of plagiarism will be submitted to the Office of Student Academic Integrity.

Part 1: Professor Mitchell

» Analysis of Differential Gene Expression During Differentiation

*Part A: Immunofluorescence to detect protein in individual cells.*

* Experimental labs: Immunofluorescence cell staining, Fluorescence microscopy.

*Part B: Quantitative investigation of differential gene expression.*

* Experimental labs: DNA quantification, Reverse Transcription, PCR, DNA electrophoresis, Real-Time quantitative PCR (qPCR).
* Computer labs: Primer design, Experimental design and data analysis, Exploring genome-wide RNA sequencing and Chromatin Immunoprecipitation sequencing data.

Part 2: Professor Lumba

» Elucidating the Function of Components in a Signalling Pathway

*Part A. Testing protein-protein interactions among Arabidopsis proteins using a yeast two-hybrid system.*

* Experimental labs: Plasmid DNA preparations, Gateway cloning of *Arabidopsis* cDNAs into yeast vectors, Yeast transformation with yeast two-hybrid plasmids, and β-galactosidase assays to detect protein-protein interactions.

*Part B. Investigating localization patterns of Arabidopsis proteins fused to fluorescent tags.*

* Experimental labs: Fluorescence microscopy to detect subcellular localization patterns of FP fusion proteins.
* Computer labs: Web tools: Gene Ontology (GO); Bio-Array Resource (BAR); Cytoscape.

**Required text:** Articles posted on Quercus.

**Evaluation:**

Tests 16 % 4 Tests @ 4 % each; dates listed in schedules

Final Exam 30 % Scheduled during the exam period

Lab Participation 10 % Graded on both attendance and participation in labs

Grant Abstract 4 %

Oral poster presentation 10 %

Reports/Lab Assignment 30 %