**PHCO 750**

**Short title:** Proteomics

**Long title:** Proteomics Methods and Applications

**Effective term:** Spring 2024 (five weeks, two 90-min class meetings each week)

**Course units/hours:** 1 credit hour

**Grading basis:** (GRAD – H, P, L, F)

**Course Component** **(lecture or lab):** Lecture & lab

**Course Instructors:**

Laura Herring, PhD; Dept of Pharmacology (Course Director)

Lee Graves, PhD; Dept of Pharmacology (Guest Lecturer)

C. Allie Mills, PhD; Dept of Pharmacology (Guest Lecturer)

**Course Description:**

The goal of this course is to familiarize students with the fundamental concepts of proteomics and its applications to real-world biomedical research. Lectures will focus on the fundamentals of mass spectrometry and three broad proteomics applications: expression proteomics, post-translational modification identification/quantitation, and affinity proteomics. Practical aspects of these applications, such as rigorous experimental design, sample preparation and data interpretation will be emphasized throughout the lectures. Students will also get hands-on experience preparing samples for LC-MS/MS analysis, as well as in-depth experience analyzing global quantitative proteomics data. Students will present on a specific topic assigned by the instructor.

There are no formal prerequisites for the course, but it is intended for 2nd year students and above who currently use or plan to use proteomics in their research.

**Course objectives** (learning outcomes):

Gain practical knowledge of mass spectrometry-based proteomics techniques in order to successfully design a rigorous proteomics experiment.

Gain experience preparing samples for proteomics analysis and analyzing proteomics data.

**Course Assignments**

Students will be given primary literature to read and a proteomics dataset to analyze.

**Assessments**

Grading will be based on attendance, participation in the class discussions, and student presentations.

**Course Format**

Students will attend ten 1.5 hr lectures and labs.

**Course Schedule**

**Session 1, 1/29/24:** Introduction to Proteomics

* Historical perspective
* Mass spectrometry instruments and methods
* Proteomics applications

**Session 2, 1/31/24:** Experimental design

* Proteomics workflow overview
* Rigor and Reproducibility
* Validation

**Session 3, 2/5/24:** Expression proteomics

* Global quantitative proteomics analysis
* Targeted proteomics
* Clinical proteomics

**Session 4, 2/7/24:** Post-translational modification (PTM) identification and quantification

* Types of PTMs
* Single protein PTM analysis
* Global phospho and ubiquitin analysis

**NO CLASS 2/12/24 – Wellness Day**

**Session 5, 2/14/24:** Affinity proteomics

* Protein-protein interactions
* Protein-small molecule interactions
* Kinome profiling

**Session 6, 2/19/24:** Lab

* Lab - sample preparation

**Session 7, 2/21/24:** Lab & lecture

* Lab – MS analysis
* Lecture - Database searching, statistical and bioinformatics analysis

**Session 8, 2/26/24:** Data analysis

**Session 9, 2/28/24:** Student presentations

**Session 10, 3/4/24:** Student presentations