SAMPLE COURSE OUTLINE

Course Code, Number, and Title:

BIOL 4415: Proteomics and Metabolomics

Course Format:
[Course format may vary by instructor. The typical course format would be:]

Lecture 4 h + Seminar 0 h + Lab 2 h

Credits: 4 **Transfer credit:** For information, visit bctransferguide.ca

Course Description, Prerequisites, Corequisites:

Proteomics is the study of a complete set of proteins in a cell. Metabolomics is the study of all the small molecular weight molecules in the cell, often the substrates and by products of enzymatic reactions. The study of proteomics and metabolomics provides fundamental insights into how the phenotype is manifest. Students focus on the tools and applications of proteomics and metabolomics analyses, and learn cutting edge methods for characterizing protein and metabolic functions, both for single organisms and for larger biological communities. They gain an understanding of the power these tools and approaches have on biological systems and experience working with datasets to solve real world problems. This course prepares students for future work designing and creating original analysis of novel proteomes and metabolomes, and provides the foundation for diverse bioinformatics applications, such as personalized medicine, bioremediation assessment, industrial quality control, and even forensic science.

Prerequisites: A minimum of C grade in BIOL 2315 and BIOL 4315

Corequisites: None

Priority registration given to students admitted to BSc Bioinformatics

Learning Outcomes:
Upon successful completion of this course, students will be able to

- Identify the major methods and approaches use to characterize protein structures and functions
- Apply the factors that determine protein functions in the cell, as well as aspects such as protein dynamics, binding, and catalysis, to understand and develop molecules that impact larger biological functions
- Modulate protein functions to affect larger metabolic networks
- Design and execute computational analysis of protein functions in order to characterize larger biological communities
- Apply computational tools for characterizing and interpreting metatranscriptomic datasets
- Apply metabolomics findings to address various biological, environmental and/or health related problems

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- Assess the impact of evolutionary change on metabolic pathways and identify and design possible new drug treatments

Instructor(s): TBA
Office: TBA **Phone: 604 323 XXXX** **Email: TBA**

Office Hours: TBA

Textbook and Course Materials:
[Textbook selection may vary by instructor. An example of texts and course materials for this course might be:}

Customized course package. Langara College. 2018.

Note: *This course may use an electronic (online) instructional resource that is located outside of Canada for mandatory graded class work. You may be required to enter personal information, such as your name and email address, to log in to this resource. This means that your personal information could be stored on servers located outside of Canada and may be accessed by U.S. authorities, subject to federal laws. Where possible, you may log in with an email pseudonym as long as you provide the pseudonym to me so I can identify you when reviewing your class work.*

Assessments and Weighting:
Final Exam 20%
Other Assessments %
(An example of other assessments might be:) %

Midterm Exam: 20%
Quizzes/Tests: 5%
Assignments: 20%
Lab work: 20%
Project: 10%
Participation: 5%

Participation format: In class assignments

Proportion of individual and group work:
Individual: 80%
Group: 20%

Grading System: Letter grade
Specific grading schemes will be detailed in each course section outline.

Passing grade: D

This generic outline is for planning purposes only.

Topics Covered:
[Topics covered may vary by instructor. An example of topics covered might be:]

1. Introduction: Protein structure and function and their relationship to gene sequence
2. Proteomics in the Lab: Synthetic expression, purification, and functional characterization
3. Measuring protein structures: X ray crystallography and computational structural modelling
4. Measuring protein dynamics: NMR and molecular dynamics simulations
5. Protein binding and structural interactions: Dimerization, protein interaction networks, gene expression regulation
6. Enzyme catalysis: How enzymes direct cellular chemistry
7. Deep mutational scanning: Using next generation sequencing to characterize protein functions
8. Connecting protein functions to metabolism
9. Metabolic networks: How do cells acquire the raw materials they need? Focus on bioremediation metabolic pathways
10. Molecular ecology: 16 S RNA sequencing based techniques to characterize microbial communities. Using microbial community data to infer community wide metabolic networks.
11. Metatranscriptomics: Assaying community wide metabolic activity
12. Evolution of metabolic networks: Focus on antibiotic and pesticide resistance
13. Drug design and discovery: Identifying new drugs and designing drug treatment strategies using metabolomic data

As a student at Langara, you are responsible for familiarizing yourself and complying with the following policies:

College Policies:

E1003 - Student Code of Conduct
F1004 - Code of Academic Conduct
E2008 - Academic Standing - Academic Probation and Academic Suspension
E2006 - Appeal of Final Grade
F1002 - Concerns about Instruction
E2011 - Withdrawal from Courses

Departmental/Course Policies:

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