BIO-212 **Biological chemistry I**

Correia Bruno

Cursus	Sem.	Type
Life Sciences Engineering	BA3	Obl.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Biochemistry is a key discipline in the Life Sciences. Biological Chemistry I and II are two tightly interconnected courses that aims to understand in molecular terms the processes that make life possible.

Content

We need to understand biological macromolecules at the atomic level, as well as their energetic properties and interplay between them. With these insights, we will dissect basic macromolecular structure and how it translates into biological function. Among the major types of biological macromolecules, including nucleic acids, proteins, lipids and glycans, we will put a main emphasis on proteins - the workhorses of cells.

- Building blocks: Sugars, lipids, amino acids
- Protein structural organization, folding
- Analysis of proteins
- Protein expression and purification
- Advanced protein purification, X-ray crystallography
- Protein structure determination by NMR and cryo-EM
- Visualization and analysis of protein structures using Pymol
- Energy and intramolecular forces in proteins
- Free energy, thermodynamics, kinetics
- Methods to measure protein-protein and protein ligand interactions.
- Enzymatic catalysis and reaction mechanisms
- Enzyme kinetics

- Principles in metabolism (common reaction mechanisms, ATP, co-factors)

- Selected metabolic pathways (glycolysis, TCA cycle, gluconeogenesis)

Keywords

roteins, lipids, carbohydrates, nucleic acids, structural biology, biochemistry, metabolism, enzymes, experimental methods, protein folding, biophysics

Learning Prerequisites

Required courses

Biology I+II, Organic chemistry I

Important concepts to start the course

- Basic understanding of chemicla matte
- Basic undersatnding of reaction kinetics
- Basic understanding of thermodynamics
- Basic Reaction mechanisms in organic chemistry

Learning Outcomes

By the end of the course, the student must be able to:

- Design experimental workflows for biochemical analysis
- Formalize reaction mechanisms of biological macromolecules
- Formulate questions that adress important biological problems
- Integrate diverse sources of data
- Generalize principles applicable to wide variety of biological problems

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate the capacity for critical thinking
- Manage priorities.

Teaching methods

- Lectures
- Exercise session accompanying each lecture
- Execises session on bioinformatics and proteins structure visualization tools

Expected student activities

- Attending to classes
- Attendance to exercise
- Class participation

Assessment methods

- written exam

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

- Kuriyan/Konforti/Wemmer - The Molecules of Life

Ressources en bibliothèque

- The Molecules of Life / Kuriyan