Course Specifications

Structure and Function of Biological Macromolecules (C003525)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size (nominal values; actual values may depend on programme)
- Credits: 4.0
- Study time: 120 h
- Contact hrs: 30.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)
- English
- Gent
- lecture: 20.0 h
- seminar: practical PC room classes: 10.0 h
- online lecture: 0.0 h
- online seminar: practical PC room classes: 0.0 h

Lecturers in academic year 2020-2021
- Savvides, Savvas
- WE10 lecturer-in-charge

Offered in the following programmes in 2020-2021
- Master of Science in Teaching in Science and Technology (main subject Biochemistry and Biotechnology) 4 A
- Master of Science in Bioinformatics (main subject Systems Biology) 4 A
- Master of Science in Biochemistry and Biotechnology 4 A
- Exchange programme in Biochemistry and Biotechnology (master’s level) 4 A

Teaching languages
- English

Keywords
- Macromolecular structure and architecture, structure-function relationships, structural biology

Position of the course

The course aims to provide deep insights into the architecture and structural evolution of all important classes of macromolecules: proteins, DNA, RNA, and into their structure-function relationships. The course will focus in particular on the role of proteins as universal binding platforms for other biological (macro)molecules. This course contributes to the following program competences: MA.WE.BB.1.1, MA.WE.BB.1.2, MA.WE.BB.1.4, MA.WE.BB.1.5, MA.WE.BB.2.1, MA.WE.BB.2.2, MA.WE.BB.2.3, MA.WE.BB.2.6, MA.WE.BB.3.5, MA.WE.BB.3.6, MA.WE.BB.4.2, MA.WE.BB.7. RES.2

Contents

PROTEINS
- Physicochemical principles and structure of amino acids and polypeptides: torsion angles/rotamers/Ramachandran plots.
- Secondary structure elements and linear groups and their combination into basic protein folds.
- The ‘Protein folding problem’.
- Intrinsically Disordered Proteins (IDP)
- Structure and evolution of important protein classes, motifs and folds.
- Structural principles and architecture of membrane proteins with reference to the general classes observed to date.
- Modular structures, Protein flexibility, Domain motions, Domain-swapping.
- Large macromolecular complexes.
- Deep exploration of the physicochemical principles underlying the interaction

(Approved)
between a protein and a binding partner: hydrogen bonds (regular and ‘low-energy-barier’ hydrogen bonds, electrostatic interactions, salt bridges, hydrophobic interactions.
DNA/RNA (optional depending on time availability)
• Structure of DNA/RNA: torsion angles, rotamers, flexibility, secondary/tertiary/quaternary structure.
• Structural rearrangements upon interaction with proteins.
• Structure of ribozymes.

Initial competences
General biochemistry, organic chemistry, and physics

Final competences
1. To obtain insights into the architecture of biological macromolecules and its relationship to their biological function.
2. To obtain insights into the fundamental principles underlying the role of proteins as a universal macromolecular binding platform.

Conditions for credit contract
Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract
This course unit cannot be taken via an exam contract

Teaching methods
Lecture, online discussion group, seminar: practical PC room classes, online lecture, online seminar: practical PC room classes

Extra information on the teaching methods
COVID-19
Due to the corona virus crisis changes in the specified teaching modes might apply, e. g. Online lectures, lecture recordings etc.

Learning materials and price
• Slides and course notes available via Ufora
• Articles
• Lecture recordings
• Software-based molecular visualization

References
GEEN

Course content-related study coaching
Interactive support via Ufora (forum en e-mail):
Appointments with the lecturer(s)

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Written examination with open questions

Examination methods in case of periodic evaluation during the second examination period
Written examination with open questions

Examination methods in case of permanent evaluation
Written examination with open questions

Possibilities of retake in case of permanent evaluation
not applicable

Extra information on the examination methods
Written examination based on scenario-based questions.

Calculation of the examination mark
written exam: 100%