GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2023-2024

Chemical Biology (C004135)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2023-2024

A (semester 2)	English	Gent	lecture

Lecturers in academic year 2023-2024

Savvides, Savvas	WE10	lecturer-in-charge
Devos, Simon	GE31	co-lecturer
Impens, Francis	GE31	co-lecturer
Madder, Annemieke	WE07	co-lecturer

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Master of Science in Teaching in Science and Technology(main subject Chemistry)	4	A
Master of Science in Chemistry(main subject (Bio)Organic and Polymer Chemistry)	4	A
Exchange Programme in Chemistry (master's level)	4	A

Teaching languages

English

Keywords

genomics, proteomics, post-genomic applications, screening methods, biophysical methods, chemical regulation, structural biology, structure-based methods in drug discovery, protein engineering, protein synthesis and modification, protein structure and function control, nucleic acid technologies in research, diagnostics and therapeutics

Position of the course

To acquire knowledge on how to use chemical principles in a biochemical context. The students will learn how to use their present knowledge on organic chemistry, analytical techniques, spectroscopic techniques, thermodynamics, modelling, structural biology, reaction mechanisms and kinetics, metabolism etc. in order to obtain a better understanding of biological processes and the interactions of macromolecules with ligands.

Contents

- General introduction to OMICS technologies
- Mass spectrometry-based proteome analysis
- Quantitative proteomics and targeted proteomics
- Analysis of protein phosphorylation events
- Analysis of modifications occurring on lysines
- Proteomics of subcellular fractions
- Activity-based proteomics => chemical tagging and profiling of active enzymes
- Target production: overview of recombinant protein expression systems.
- Assays and screening methods for studying protein binding and enzymatic activities
- Structure-based approaches to rational drug design and molecular design
- Thermodynamic and kinetic parameters governing binding events, e.g. in protein-protein interactions, protein-ligand interactions.
- Controlling protein-protein interactions using chemical inducers and disruptors of dimerisation
- Engineering control over protein function using chemistry: how to synthesize a protein containing unnatural amino acids, labeling of proteins and peptides

Initial competences

The student should have obtained a credit for the following courses: “General Biochemistry: Proteins!”, “Chemistry I: Structure of Matter”, “Chemistry II: Changes in Matter”, “Physical Chemistry I: Chemical Thermodynamics”, “Introduction to Organic Structures”, “Organic Chemistry: Reactivity 1”, “Organic Chemistry: Reactivity 2”, “Organic Chemistry: Reactivity 3”, “Structural analysis”, “Synthetic Methods in Organic Chemistry”, “Analytical Chemistry: Principles” and “Analytical Separation Methods”or should have acquired the envisaged competences through equivalent courses - demonstrated through credits.

Final competences

1 Knowledge on the possibilities of proteomics technologies for the analysis chemical biology research questions.
2 Insight in chemical application of post-genomic information.
3 Knowledge on the design and use of markers and labels for the visualisation of biological processes.
4 Knowledge of several biophysical methods for the study of biochemical interactions involving small molecules interacting with biomolecules.
5 Knowledge on the chemical regulation of biosynthetic pathways.
6 Knowledge on the current methods for synthetic nucleic acid and protein production and production hosts.
7 Knowledge on the different methods for protein synthesis and modification.
8 Knowledge on chemical tools for studying protein structure and function.
9 Knowledge on methods for studying and controlling protein protein interactions.
10 Knowledge on chemical ligation methodologies.
11 Critical analysis and understanding of a relevant recent research topic as lectured upon by a specialist researcher in the field.

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

Extra information on the teaching methods

Because of COVID19 alternative ways of teaching could be implemented if necessary.
Use of the Electronic Learning Environment (ELE: https://ufora.ugent.be/d2l/home): articles and extra material are on-line available.

Learning materials and price

Copies of slides, English notes and literature references. Estimated cost: 10 EUR
ELE: Documents available on Ufora

References

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Course content-related study coaching

Possibility for discussion and questions following each lecture and on appointment.

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Calculation of the examination mark

Periodic evaluation (100%).