



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Biochimica delle Proteine

2021-1-F0601Q060

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#### Aims

The course aims at introducing concepts related to folding, structure (whether well-defined or disordered), function and evolution of proteins. Besides folding and turnover of proteins in vivo, phase separation and protein aggregation, which are at the basis of relevant physiological and pathological phenomena, will also be considered. The course intends not only to convey interest in the mechanisms underlying the functioning and evolution of proteins, but to equip students with useful tools also in the biotechnological field, for the design of synthetic proteins/peptides or the improvement of natural ones. The general objectives of the course are the following:

Knowledge and understanding.

At the end of the course, students will have acquired knowledge on protein folding mechanisms, on the relevance of structural flexibility and functional promiscuity, of conformational and functional transitions, often related to protein-protein interactions, and relevant in both physiological and pathological conditions.

Ability to apply knowledge and understanding.

The examples analyzed during the course reveal main protein functions and the underlying mechanisms, highlighting the role of intrinsic structural properties of proteins and their crosstalk with the environment. Such circumstances are expected to be recognizable in different contexts than those exemplified. Moreover, it is expected this knowledge could be exploited to design, for instance, new synthetic proteins.

Autonomy of judgment.

The student will be stimulated to recognize the relationships between the structure and function of proteins and foresee the effects of some environmental contexts on both.

Communication skills.

At the end of the course, students are expected to acquire the appropriate vocabulary and linguistic skills to

describe biochemical phenomena.

Learning skills

Students will apply their knowledge in the field of Protein Science, to understand functional and structural studies.

## **Contents**

Theory and techniques to study protein folding and stability

In-vivo protein folding and turnover

Protein-protein interactions

Protein evolution

## **Detailed program**

Theory and techniques to study protein folding and stability

- Concepts of folding, denaturation and structural disorder
- Folding theories
- Different structural types (well folded, disordered, metamorphic proteins etc) and study techniques

In-vivo protein folding and turnover

- Effects of molecular crowding on structure and function of proteins
- In vivo folding of proteins
- Protein turnover and degradation

Protein-protein interactions

- Modes of protein-protein interaction
- Interaction hub of protein and systems biology
- Phase separation and transition
- Protein aggregation and structure of amyloid fibrils

Protein evolution

- Evolutionary mechanisms and evolvability

Techniques of protein engineering and their applications

## **Prerequisites**

Prerequisiti: Basic knowledge in the fields of Biochemistry and Cellular biology.

## **Teaching form**

Classroom lectures supported by PowerPoint slides, videos, \_\_\_\_\_

## **Textbook and teaching resource**

PPT slides and videos published on the Moodle website (<http://elearning.unimib.it/>).

Articles referred/described in the lessons

## **Semester**

First semester

## **Assessment method**

Oral exam: an interview of approx. 30 minutes, with questions on the content of lectures and related scientific articles (available on the Moodle site). The understanding of course issues, the ability to recognize the technical-scientific challenges and their possible solutions, as well as the acquisition of linguistic properties and the clarity of the exposition will be evaluated

## **Office hours**

On demand, by mail to [stefania.brocca@unimib.it](mailto:stefania.brocca@unimib.it)

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