Food Biophysics

Ali Ebrahimi Pure, PhD

(Team 10: Soft Condensed Matter)

Registration: send an email to ebrahimipure@ichf.edu.pl by October 16. The course starts within the week of October 20–25, 2025

(The availability of this lecture course depends on whether at least three Warsaw4PhD students are registered.)

Outline

This lecture course introduces food as a soft matter system, where biomacromolecules form complex structures and functionalities. We will discuss food macromolecules (proteins, polysaccharides, and lipids) as biopolymers and their role in building structures such as gels, emulsions, and foams. Special attention will be given to:

- Emerging protein sources (plant, microbial, and engineered proteins) and their structural/functional challenges.
- Rheology and textural analysis as tools to link molecular interactions with macroscopic flow and mechanical properties.
- Food macromolecules as gel-forming agents, focusing on phase transitions and crosslinking strategies.
- Food matrices as functional carriers, exploring applications in personalized nutrition, nutrient encapsulation and drug-delivery systems.

The course integrates concepts from soft matter physics and food chemistry, highlighting current research directions and experimental methods relevant for interdisciplinary studies. The lectures will combine fundamental introductions with case-study examples, aiming to clarify how each concept translates into real research applications. The goal is to provide participants with both a solid conceptual framework and practical insights into the role of food biophysics in science and technology.