Basic Information:
Course Title: **FUNCTIONAL (NANO)STRUCTURES**
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Total Teaching Hours•30 hours

Annotation (up to 150 words)

The development of innovative nanostructures with specific properties is a challenge for the modern science. Therefore, the presented lectures are focused on the discussion of different structures suitable for various applications in the field of bionanotechnology. The lectures goals to provide basic knowledge in formation, structure and properties of different nanostructures.
The program is structured in three interconnected modules. *The lectures are addressed to PhD students working in the field of physical chemistry, polymer chemistry and bionanotechnology.*

Course content (brief description by topics or modules)
Module 1. Introduction to nanomaterials
Module 2. Biopolymers
Module 3. Electrical properties and stability of disperse systems. Methods for characterization
Module 4. Classification of functional nanostructures- preparation, stability, Methods for characterization, application and limitations:

- Inorganic particles
- Encapsulation, protection, and controlled release of hydrophilic (bio)active components
- Encapsulation, protection, and controlled release of hydrophobic (bio)active component
- Carbon-based nanostructures — types and structure
- Functional nanostructures suitable for gene and tissue engineering
- "Pickering" emulsions, colloidosomes, and nanosomes
- Toxicity of nanostructured materials
- Applications: Functional nanostructures used in the treatment of cardiovascular diseases
- Applications: Functional nanostructures used for creating self-cleaning surfaces
- Applications: Functional nanostructures used to prevent biofilm formation on macroscopic surfaces

Teaching and assessment methods
In-person/distance learning / individual preparation
Written exam/presentation on a specific topic

Competencies acquired as a result of training (3—5 points)
- Acquisition of new knowledge about biopolymers
- Acquisition of new knowledge about nanomaterials

• Acquisition of new knowledge about methods for the synthesis and characterization of new materials

Literature: Prepared lecture materials.