

**Course offered by the PhD program
in Civil, Chemical and Environmental Engineering
a.y. 2025/2026 (41 cycle)**

(course is open for participation of students from other PhD cycles or programs)

1. Title

Bio-inspired design of drug delivery system.

2. Course Description

The course aims to provide PhD students with the knowledge and skills to design bioinspired biomaterials for drug delivery, focusing on the optimization of material properties, fabrication techniques, and their translation into industrial applications.

State of the art

- definition, classification, conventional methods of production
- stimuli-responsive release mechanisms
- supercritical assisted processes
- study of the effect of process parameters
- encapsulation of antioxidants, dietary supplements, antibiotics, antibodies, proteins.
- industrial and scale-up applications

Drug Delivery Systems

- liposomes: classification, methods of production, advanced applications
- biodegradable polymer-based drug carriers
- polymeric foams for drug delivery

Mathematical Modeling of Drug Delivery Systems

- mathematical models for drug release kinetics
- diffusion models in porous and polymeric matrices

Characterization Methods

- scanning Electron Microscope: analysis of surface, porosity, and particle size distribution.
- optical microscopy
- quantification of encapsulation efficiency methods

Mechanical Properties of Bioinspired Biomaterials

- mechanical effects on diffusion and degradation affecting release kinetics.
- tensile/compression tests for structural evaluation of patches.

3. Course Organization

The course, organized into a single module, will consist of classroom lessons.

4. Teacher

The course teacher will be Dr. Paolo Trucillo.

5. Duration and credits

The course (10 hours) will consist of 2 lessons, 5 hours each, for a total of 2 credits.

6. Activation mode and teaching period

The course will be held on the 29th and 30th October 2025.

7. Deadline for registration

Students are requested to inform the teacher by e-mail paolo.trucillo@iunina.it about their registration.

8. Final exam

The examination test will consist of a final written text on a topic defined by the teacher.