

<b>“Bio-nanotechnology in plant research” – part II</b>		
<b>Institute of Plant Genetics Polish Academy of Sciences</b>	<b>Coordinator:</b> dr hab. Lidia Błaszczyk, prof. IPG PAS	<b>Tutors:</b> 1. Prof. Marko Vinceković, PhD 2. Dr hab. Wojciech Juzwa, Prof. UPP 3. Prof. Vadim Kessler, PhD

**General information:**

Number / form (s) / type (s) of classes	A series of lectures, 12 didactic hours (supervised by lecturers)
Didactic cycle	Summer semester 2022/2023
Language	English
ECTS credits	2

Objective of the course:

**To understand the synthesis and applications of nanomaterials in plant research**

**Topics:**

1. **Basics of encapsulation process** – 2 h lecture (23.05.2023); **Application of encapsulation process in agricultural prediction of vegetables** – 2 h lecture (30.05.2023); Marko Vinceković, PhD, University of Zagreb, Faculty of Agriculture.
2. **The use of flow cytometry in plant research** – 2 h lecture (13.06.2023) + 2 h lecture (27.06.2023); Wojciech Juzwa, PhD, Poznań University of Life Sciences, Department of Biotechnology and Food Microbiology.
3. **The development of molecular precursor-driven approaches to nanomaterials and of applications of nanoparticles and nanostructures in the domains of agriculture** – 2 h lecture (06.06.2023) + 2 h lecture (20.06.2023); Vadim Kessler, PhD, Swedish University of Agricultural Sciences, Department of Molecular Sciences.

**Effects of the course (in terms of knowledge, skills):**

1. **Basics of encapsulation process. Application of encapsulation process in agricultural prediction of vegetables** – PhD student will:
  - a) get new knowledge in area of encapsulation;
  - b) be able to choose the best encapsulation technique.
2. **The use of flow cytometry in plant research** – PhD student will:
  - a) become acquainted with the main assumptions and principles of flow cytometry technique;
  - b) be able to design an experiment using flow cytometry to characterize the defined parameters of plant cells.
3. **The development of molecular precursor-driven approaches to nanomaterials and of applications of nanoparticles and nanostructures in the domains of agriculture** – PhD student will:
  - a) get insight into principal molecular mechanisms in formation of mineral nanoparticles in the lab and in nature;
  - b) get insight into surface interactions of mineral nanoparticles;
  - c) get insight into how chemical reactivity of mineral nanoparticles can potentially influence plant metabolism.

**Course content:**

1. **Basics of encapsulation process. Application of encapsulation process in agricultural prediction of vegetables:**
  - a) new knowledge in application of encapsulation process;

- b) skills in functional food production.
- 2. The use of flow cytometry in plant research:**
- a) new perspectives of cell analysis using the single-cell approaches;
  - b) skills in instrumental analytics of cellular parameters.
- 3. The development of molecular precursor-driven approaches to nanomaterials and of applications of nanoparticles and nanostructures in the domains of agriculture:**
- a) nanoparticles and nanostructures in nature;
  - b) general principles of Sol-Gel Chemistry in aqueous and non-aqueous medium;
  - c) inorganic and hybrid encapsulation matrices;
  - d) mineral nanoparticles as tools for plant stress mitigation.

**Teaching methods / techniques:**

- **lectures in English**, using multimedia techniques (including ZOOM platform)

**Evaluation of learning outcomes:**

- **written exam**