CIRCULAR GREEN NANOBIOTECHNOLOGY

PROGRAM
BLENDED INTENSIVE PROGRAMME (BIP)
ERASMUS +

Warsaw University of Life Sciences

1816 2026

210 YEARS OF SGGW TRADITION

Universität Potsdam

Lithuanian University of Health Sciences

Daugavpils Universitāte

Scientia Vincēs

Iași University of Life Sciences

VIRTUAL COMPONENT

Duration: 3 weeks

Workload: 25 contact hours + 15 hours of individual work

Format: Online (synchronous & asynchronous)

Platforms: MS Teams, Miro, Padlet, Mentimeter

Learning objectives:

- build a shared interdisciplinary knowledge base
- prepare students for experimental laboratory work
- develop international teamwork and digital collaboration skills
- introduce sustainability, biosafety, and circular economy principles

VIRTUAL COMPONENT

WEEK 1 – Date: May 29, 2026

Foundations of Circular Green Nanobiotechnology

Module 1: Introduction to Circular Nanobiotechnology

Lead: Warsaw University of Life Sciences – SGGW

- Principles of circular economy and green chemistry
- Life cycle assessment of nanomaterials
- “Do No Significant Harm” (DNSH) principle
- Ethical and environmental aspects of nanotechnology

Activities:

interactive lecture, short quizzes, group discussion

VIRTUAL COMPONENT

WEEK 2 – Date: June 5, 2026

Bio-based and Biomedical Perspectivesading

Module 2: Bio-based Nanomaterials and Plant Polymers

Lead: University of Potsdam

- Starch, cellulose, chitosan and plant-derived polymers
- Structure–function relationships at the nanoscale
- Design of biodegradable and renewable nanostructures

Module 3: Biomedical and Cellular Interactions of Nanomaterials

Lead: Lithuanian University of Health Sciences & SGGW

- Nanoparticle–cell interactions
- Oxidative stress and cellular adaptation
- Basics of nanosafety testing and in vitro models

Activities: lectures, case-study analysis, teamwork

VIRTUAL COMPONENT

Week 3: June 12, 2026.

Integration and Team Project

Module 4: Team Project – “Design Your Green Nanomaterial”

Lead university: Daugavpils University – DU (Latvia)
Contributing partners: SGGW, University of Potsdam, LSMU, Iași University of Life Sciences (IULS)

Joint supervision by all partner universities

- **interdisciplinary team formation**
- **design of a bio-based nanomaterial concept**
- **preliminary sustainability and biosafety assessment**
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Digital tools:

- **Miro (concept mapping)**
- **Padlet (project documentation)**

Outcome:

- **short pre-laboratory report**
- **project presentation**

LABORATORY SECTION

June 18-24

Day 1 – Orientation & Scientific Context

Agenda:

- 11:00-12:00 Registration (SGGW Library)
- 12:00-13:00 Welcome session and programme overview
- 13:00-14:00 Introduction to laboratory infrastructure, facilities and safety briefing
- 14:00-15:00 Lunch
- 15:00-16:00:discussion of team projects developed during the virtual phase
- 16:00-17:00 alignment of experimental plans and expectations
- 18:00-21:00 Evening welcome and networking refreshments

Goal:

To ensure a shared understanding of the programme objectives, laboratory procedures, and safety principles, and to align virtual project concepts with on-site experimental work.

Day 2 – Eco-Friendly Extracts for the Green Synthesis of Nanomaterials

Agenda:

9:00-10:00 Introduction to eco-friendly extract-based synthesis (Build.23)
11:00-13:00 Preparation of plant-based extracts
13:00-14:00 Microbial-derived extracts for nanomaterial synthesis
14:00-15:00 Lunch
15:00-16:00 Cell-based and in vitro extract systems
16:00-17:00 Wrap-up discussion and reflection
18:00-21:00

Goal:

provide hands-on experience with eco-friendly extract-based synthesis of nanomaterials and to demonstrate how plant, microbial, and in vitro biological systems influence synthesis efficiency, sustainability, and material properties.

Day 3 – Green Synthesis of Nanomaterials

Agenda:

9:00-12:00 Synthesis of bio-based nanomaterials (build. 23)
12:00-13:00 Application of green chemistry approaches
13:00-13:30 Lunch
13:30-14:30 Surface functionalization strategies (build.23)
15:00-15:45 Transfer to the POLIN Museum of the History of Polish Jews
16:00 -18:00 Guided tour of the POLIN Museum of the History of Polish Jews

Goal:
To acquire practical skills in the green synthesis and functionalisation of bio-based nanomaterials while understanding sustainable and environmentally responsible laboratory practices.

Day 4 – Physicochemical Characterisation

Agenda:

9:00-11:00 UV–Vis and FTIR spectroscopy(build.23)
11:30-13:30 DLS and zeta potential analysis
13:30-14:30 Lunch
14:30-16:30 Interpretation of size, stability, and surface properties
16:45 Meeting point in front of the Crystal Hall build.
16:00-17:00 SGGW University campus tour

Goal:
To learn how to characterise nanomaterials using complementary analytical techniques and to interpret physicochemical data relevant to nanoscale structure
and functionality.

Day 5 - Advanced Structural Analysis

Agenda:

9:00-11:00 Lecture characterisation of nanoparticles and nanomaterials
11:30-13:30 SEM and TEM microscopy (build.23)
13:30-14:30 Lunch
14:30-15:30 Evaluation of morphology and nanostructur
15:45- 17:00 Correlation of structure with synthesis parameters

Goal:
To learn how to characterise nanomaterials using complementary analytical techniques and to interpret physicochemical data relevant to nanoscale structure
and functionality.

Day 6- Nanosafety and Biological Interactions

Agenda:

9:00-11:00 nanoparticle–cell interaction studies with use of in vitro biological models
11:00-13:00 assessment of cytotoxicity and biocompatibility - in vitro cell lines
13:00-14:00 Lunch
14:00-15:30 bacterial response and biocompatibility assessment
15:30-16:30 evaluation of nanomaterial effects on aquatic plant models (duckweed)
16:45- 17:30 Transfer to the Royal Łazienki Park (Łazienki Królewskie)
17:30 -19:00 Guided cultural visit to the Royal Łazienki Park (Łazienki Królewskie)

Goal:
To raise awareness of nanosafety principles and evaluate biological responses to nanomaterials in relevant in vitro systems. The aim is to integrate multidisciplinary datasets and enhance analytical thinking by connecting material properties with biological and safety outcomes.

Day 7- Integrated Nanosafety Assessment and Summary of Biological Interactions

Agenda:

09:00–09:30 overview of biological models used in the programme
09:30–10:30 summary of in vitro nanosafety results
11:00–12:00 summary of bacterial interaction studies
12:00–13:00 summary of plant-based interaction studies
13:00–14:00 integrated discussion and final conclusions

Goal:
To integrate and critically evaluate results obtained from in vitro cell lines, bacterial models, and aquatic plant assays, enabling participants to understand nanosafety, biological interactions, and environmental relevance of bio-based nanomaterials in a comprehensive and interdisciplinary manner.

POST-LABORATORY VIRTUAL COMPONENT

Date: June 30, 2026

Lead university:

Warsaw University of Life Sciences – SGGW (Poland)

Partner universities involved:

- **University of Potsdam (Germany)**
- **Lithuanian University of Health Sciences- LSMU (Lithuania)**
- **Iași University of Life Sciences- IULS (Romania)**
- **Daugavpils University – DU (Latvia)**

POST-LABORATORY VIRTUAL COMPONENT

Agenda:

09:00–09:15 opening and objectives of the post-laboratory session
09:15–11:00 summary of laboratory results – in vitro models, bacterial interaction studies and plant-based interaction studies
11:30–13:00 integrated discussion and sustainability assessment
comparison across biological models
environmental, agricultural, and veterinary implications
alignment with circular economy principles
13:00–14:00 student and expert feedback
discussion of results, limitations, and applications

Goal:

Integrate and critically evaluate experimental results obtained from in vitro cell lines, bacterial models, and aquatic plant assays, and to assess the nanosafety, sustainability, and real-world relevance of bio-based nanomaterials.

See you online and on campus
learn, collaborate, and innovate sustainably!

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