

## Plant Biotechnology (0000145)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 4.0** **Study time 108 h**

**Course offerings and teaching methods in academic year 2024-2025**

A (semester 2)	English	Incheon	practical peer teaching seminar lecture group work
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**Lecturers in academic year 2024-2025**

Offered in the following programmes in 2024-2025	crdts	offering
<a href="#">Bachelor of Science in Biochemistry and Biotechnology</a>	4	A
<a href="#">Bachelor of Science in Molecular Biotechnology</a>	4	A

**Teaching languages**

English

**Keywords**

plant transformation, transgenesis & cisgenesis, gene silencing, gene editing, applications of transgenic plants, legislation, ethical aspects

**Position of the course**

This course is an introduction to plant biotechnology. The student will become familiar with different techniques used for plant transformation. Several case studies will be discussed with the focus on regulation, usefulness, risk analysis, societal aspects, etc.

**Contents**

- I. Plant transformation
    - I.1. Plant transformation and regeneration: the basis
    - I.2. Agrobacterium mediated plant transformation
    - I.3. Direct Gene Transfer (DGT) methods
    - I.4. Expression of transgenes in plants
    - I.5. Inactivation of plant genes
    - I.6. New breeding technologies
    - I.7. Safety assessment
  - II. Applications
    - II.1. Herbicide resistance
    - II.2. Insect resistance
    - II.3. Disease resistance & tolerance to abiotic stress
    - II.4. Yield and quality
    - II.5. Non-food & pharming
    - II.6. GMO regulations and discussions
- Lab excercises: Transformation of rice. CRISPR gene editing. Bioinformatics PC-excercises.  
Group work and presentations.

**Initial competences**

Knowledge of biochemistry, molecular biology, and plant biology

**Final competences**

- 1 Know different possible techniques to improve plants: breeding, mutagenesis, transgenesis,

cisgenesis, genome editing and other new breeding techniques...

- 2 Be able to distinguish the different applications of GMOs in agriculture and to describe the commercially available products.
- 3 Substantiate the possibilities of using plants for the production of enzymes, fine chemicals, pharmaceuticals, etc.
- 4 Be able to explain the definitions of GMO, event, etc. especially in a regulatory context.
- 5 Be able to discuss the regulatory steps needed before GMO commercialisation.
- 6 Critically evaluate scientific papers on GMOs including safety studies.
- 7 Know and critically compare transformation technologies for the development of improved plants.
- 8 Know how to assess, risks and benefits of specific GMO applications.
- 9 Collect and critically analyze data from scientific papers and make a scientifically valid summary.
- 10 Discuss genetic engineering applications with scientific arguments and in a multidisciplinary context.
- 11 Assess new scientific developments on genetic engineering and applications in a scientific and socio-economic context.
- 12 Adopt a positive attitude towards independent and lifelong learning.
- 13 Communicate in English via oral presentation.
- 14 Appreciate the public opinion and the GMO discussion.
- 15 Formulate, based on scientific data, a personal opinion on GMO applications without disrespect for a different opinion of others.
- 16 Collect and critically analyze massive amounts of often contradictory web-based information and integrate this with scientific data to come to a scientifically sound conclusion.

#### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

#### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

#### **Teaching methods**

Group work, Seminar, Lecture, Practical, Peer teaching

#### **Extra information on the teaching methods**

lectures 20 hrs

practicals 12 hrs

PC practicals 4 hrs

peer teaching 6 hrs

group work 6 hrs

#### **Study material**

Type: Syllabus

Name: Syllabus

Indicative price: Free or paid by faculty

Optional: no

Additional information: A compact syllabus is available.

Type: Slides

Name: Course slides

Indicative price: Free or paid by faculty

Optional: no

Available on Ufora : Yes

Additional information: Powerpoint presentations and movies explaining basic principles are available on Ufora.

#### **References**

Plant Biotechnology. The genetic manipulation of plants. Slater, Scott and Fowler, 2nd edition. Oxford University Press

#### **Course content-related study coaching**

Extra information and explanation can be obtained through e-mail, personal contact or Ufora.

#### **Assessment moments**

end-of-term and continuous assessment

#### **Examination methods in case of periodic assessment during the first examination period**

Written assessment with open-ended questions

**Examination methods in case of periodic assessment during the second examination period**

Written assessment with open-ended questions

**Examination methods in case of permanent assessment**

Participation, Peer and/or self assessment, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible in modified form

**Calculation of the examination mark**

The evaluation of the theory counts for 3/4, the permanent evaluation of the exercises, peer teaching and participation to discussions for 1/4.