# COURSE OUTLINE

## 1. GENERAL

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|---|---|---|---|
| **SCHOOL** | AGRICULTURAL SCIENCES | | |
| **ACADEMIC UNIT** | AGRICULTURE | | |
| **LEVEL OF STUDIES** | UNDERGRADUATE | | |
| **COURSE CODE** | AGR_906 | **SEMESTER OF STUDIES** | 9th |
| **COURSE TITLE** | Applications of Biotechnology in Agriculture | | |

| **INDEPENDENT TEACHING ACTIVITIES** *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures | 3 | |
| Seminars | 1 | |
| **Total** | 4 | 5 |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).* | | |

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|---|---|
| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | Skills development |
| **PREREQUISITE COURSES:** | Typically, there are no prerequisite courses. Students must have basic knowledge of Statistics. |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek. Teaching may be performed in English in case foreign students attend the course. |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes (English) |
| **COURSE WEBPAGE (URL)** | |

## 2. LEARNING OUTCOMES

**Learning outcomes**

*The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.*

*Consult Appendix A*

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course aims at introducing the students to the concepts of Agricultural Biotechnology and to the applications of modern biotechnological methods to Agriculture.

By completing this course, the students are expected to have achieved the following skills and capabilities.:

They will acquire knowledge about the range of approaches to genetically manipulate plants and microorganisms.

- They will be able to get insight in applications or recombinant DNA technology in agriculture.
- They will gain comprehensive knowledge regarding plant tissue culture and the application of modern biotechnology to genetic improvement of plants.
- The students will demonstrate the ability to develop, interpret, and critically evaluate modern approaches to scientific investigation.
- Acquire deep understanding regarding the legal and ethical issues arise from the application of biotechnology in

Agriculture and the relationship between society and science and the justification for biotechnological manipulation of plants, and microorganisms.

**General Competences**

*Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?*

| | |
|---|---|
| *Search for, analysis and synthesis of data and information, with the use of the necessary technology* | *Project planning and management* |
| *Adapting to new situations* | *Respect for difference and multiculturalism* |
| *Decision-making* | *Respect for the natural environment* |
| *Working independently* | *Showing social, professional and ethical responsibility and sensitivity to gender issues* |
| *Teamwork* | *Criticism and self-criticism* |
| *Working in an international environment* | *Production of free, creative and inductive thinking* |
| *Working in an interdisciplinary environment* | *……* |
| *Production of new research ideas* | *Others…* |
| | *…….* |

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Decision making
Project planning and management
Respect for the natural environment
Production of new research ideas
Promotion of free, creative and inductive thinking

## 3. SYLLABUS

1. Principles of Genetic Engineering
2. Genetic manipulation and recombinant DNA technology
3. Model organisms in Agricultural Biotechnology
4. Genetic transformation methods.
5. Production of genetically modified plants
6. Plant tissue culture, nutrient solutions, hormones. Plant regeneration. Anther and protoplast culture, somaclonal variation
7. Gene targeting
8. Transient gene expression. Gene silencing.
9. Modifying the physiological processes in GMO plants
10. Applications of GMO plants
11. Identification of GMO plants. Legal and ethical issues. Bioethics, patents, social impact etc..
12. Modern approaches in plant breeding. Omic technologies
13. Bioinformatics. Data bases and genomic repositories.

## 4. TEACHING AND LEARNING METHODS - EVALUATION

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|---|---|
| **DELIVERY** *Face-to-face, Distance learning, etc.* | Face to face lectures in the classroom. |
| **USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES** | Use of Information and Communication Technologies (ICTs) (e.g. Microsoft PowerPoint) in teaching. The contents of the course of each chapter are |

<table>
<tr><td>Use of ICT in teaching, laboratory education, communication with students</td><td>uploaded on the internet, that the students can freely download using a password which is provided to them at the beginning of the course.</td></tr>
<tr><td>TEACHING METHODS<br>The manner and methods of teaching are described in detail.<br><br>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.<br><br>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (3 contact hours per week x 13 weeks)</td><td>39</td></tr>
<tr><td>Seminars (1 contact hours per week x 13 weeks)</td><td>13</td></tr>
<tr><td>Hours for private study of the student, preparation and attendance mid-term or/and final examinations.</td><td>73</td></tr>
<tr><td>Total number of hours for the Course (25 hours of workload per ECTS credit)</td><td>125 hours (total student workload)</td></tr>
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</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION<br>Description of the evaluation procedure<br><br>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other.<br><br>Specifically, defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Final mandatory written examination, full length questions and / or multiple-choice questions. Minimum pass grade= 5, scale 0-10.<br><br>All the above are taking place in Greek as well as in English for foreign students (e.g. ERASMUS students) if any.</td></tr>
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## 5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*


1. Molecular Biology of the Gene. Watson James, Baker Tania, Bell Stephen, Gann Alexander, Levine Michael, Losick Richard. Pearson 2013.
2. Recombinant DNA: Genes and Genomes - A Short Course. James D. Watson, Jan A. Witkowski, Richard M. Myers, Amy A. Caudy. Cold Spring Harbor Laboratory Press; 3rd edition (December 8, 2006)
3. Plant Biotechnology and Agriculture: Prospects for the 21st Century. Arie Altman and Paul Michael Hasegawa. Academic Press
4. OMICS-Based Approaches in Plant Biotechnology Rintu Banerjee, Garlapati Vijay Kumar, et al. Wiley-Scrivener


- *Related academic journals:*

1. Nature Biotechnology
2. Plant Biotechnology Journal
3. Plant Biotechnology Reports
4. Nature Plants
5. Scientific Reports