COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	SCHOOL OF PLANT SCIENCE		
DEPARTMENT	CROP SCIENCE		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	3250	**Semester:**	9th Crop Science
COURSE TITLE	**Biotechnology and Plant Breeding**		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**ECTS**
	Lectures	3	3
	Laboratory Exersices	2	2
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise* *Specialty (AGRONOMY AND PLANT BREEDING - compulsory, APPLIED PLANT PHYSIOLOGY AND BIOTECHNOLOGY OF MICROORGANISMS - optional)*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek (and English if required)		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

2. LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

This course will serve as a general introduction to the principles of plant breeding through biotechnology. Breeding and biotechnology is of particular importance to plant scientists since most cultivated plants are the product of breeding through both classical and modern approaches. The goal of the course is to integrate all of the knowledge that students have learned in order to comprehend how biotechnology is applied to plant breeding. Emphasis is given on the understanding of the integration of all modern techniques related to plant biotechnology to improve the crops. The teaching of the course creates an interdisciplinary environment since it is provided by faculty members with different subject areas.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

Acquisition of teamwork skills: analysis and synthesis of knowledge, decision making

Data mining using online and university library-based recourses.

Work in an interdisciplinary environment

Promotion of free creative and inductive thinking

3. COURSE CONTENT

Definition of biotechnology, applications of biotechnology in plant improvement. Structure and function of genetic material. Review of Key Concepts.
Molecular markers. Categories of molecular markers. Description.
Genetic linkage. Physical mapping. Genetic mapping. Gene mapping based on genetic linkage.
Applications of molecular markers in plant breeding. Marker assisted selection and the use of molecular markers in classical breeding programs (mass selection, recurrent selection, backcross). Gene pyramiding using molecular markers. Identification of varieties with favorable agronomical traits. QTL mapping.
Genomics and plant breeding. Study and organization of plant genomes. Genomic DNA libraries. Structural genomics. Sequencing plant genomes. Comparative genomics.
Functional genomics. Transcriptomic analysis. Proteomic analysis. Metabolite analysis. Phenotypic analysis (phenomics). Analysis of gene function. Applications of -omic technologies in plant breeding.
Epigenetics and plant improvement
Methods of genetic modification. Modern techniques. Utilization in Plant Improvement. Gene editing techniques.
Applications of tissue culture in plant improvement.
Cryopreservation of plant material and utilization in plant breeding.
Bioinformatics and applications in plant breeding

4. TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing and lab

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of online resources and electronic devices. Communication with students. Social media Learning process support by access to e-class asynchronous distance learning platform. On-line Bioinformatic databases and repositories mining, etc.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.*	

Activity/ Method	Semester workload
Lectures	39
Laboratory practice	26
Individual laboratory project (data processing and commenting)	20
Personal study	40
Total of Course (25 hours of workload per ECTS)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**I. Final written exam in the theory of the course** including a combination of 10 short-answer questions, open-ended questions and multiple choice questions. **II. The written examination in the laboratory part of the course** includes 5 short answer, open-ended, problem solving and documentation questions (the ability to apply the principles and mechanisms and the way of approaching and documenting the answer is evaluated).

5. SUGGESTED BIBLIOGRAPHY:

Biotechnology and Plant Breeding (Editor: Roberto Fritsche-Neto)

"Principles of plant genetics and breeding" by Acquaah, George._3rd edition SBN: 978-1-119-62632-9 December 2020 Wiley-Blackwell
"Principles and applications in plant biotechnology" by P. Xatzopoulos, 2021

Related scientific journal: Molecular Breeding, Plant Breeding, Plant Biotechnology, Molecular Plant Breeding ,Frontiers in plant science, Journal of Plant Biotechnology

6. TEACHERS:

-Theory:
Penelope Bebeli, Professor
Vasileios Papasotiropoulos, Professor
Andreas Voloudakis, Assistant Professor
Eleni Tani, Assistant Professor

-Laboratory:
Pinelopi Bebeli, Professor
Vassilis Papasotiropoulos, Professor
Andreas Voloudakis, Assistant Professor
Eleni Tani, Assistant Professor
Anastasios Katsileros, Teaching assistant
Gkoufa Maria, Teaching assistant