COURSE OUTLINE

1. GENERAL INFORMATION

FACULTY/SCHOOL	SHOOL OF PLANT SCIENCES		
DEPARTMENT	CROP SCIENCE		
LEVEL OF STUDY	Pregraduate		
COURSE UNIT CODE	252	**Semester:**	9th
COURSE TITLE	MOLECULAR PLANT NUTRITION PHYSIOLOGY		
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	5
Laboratory exercises		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 Skills Development		
PREREQUISITE COURSES:	Plant Physiology Functional Plant Anatomy		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://oeclass.aua.gr/eclass/courses/COMCOUR109/		

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*

Upon successful completion of the course, students will know:

• The genetic basis of plant nutrition

• The molecular basis of plant nutrition homeostatic mechanisms
• The molecular basis of nutrient deficiencies.
and they will understand:
• Laboratory approaches to molecular analysis of plant nutrition mechanisms with an emphasis on bioinformatic analysis of proteins related to nutrient homeostasis
• The contribution of these approaches to the development of more efficient sustainable agriculture systems

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

Ability to apply the principles of molecular biology to plant nutrition.

3. COURSE CONTENT

Lectures

1. The genetic basis of plant nutrition. Proteins related to nutrient homeostasis: nutrient transporters, complex proteins, storage proteins, molecular messengers, regulatory proteins.
2. Homeostatic mechanisms of plant nutrition. Homeostasis of nitrogen, phosphorus, sulfur and iron. Interaction of homeostatic mechanisms.
3. The molecular basis of nutrient deficiencies. The response of homeostatic mechanisms in cases of nitrogen, phosphorus, sulfur and iron deficiencies.
4. Molecular messages and message transduction pathways in the short-term, medium-term and long-term responses to nitrogen, phosphorus, sulfur and iron deficiencies.

Laboratory exercises

Exercises in a laboratory room with the aim of obtaining experimental data on the physiology of plant nutrition, interpreting them and presenting them in a laboratory report.

Exercises include:

1. Explaining the big picture "homeostatic system -> in silico analysis -> qPCR"
2. Biological databases: Structure, description, search
3. In silico analysis: protein group phylogenetic tree
4. cDNA construction: nucleic acid extraction, mRNA extraction, cDNA construction
5. Primer design, qPCR
6. Interpretation of results, understanding of the efficiency of the homeostatic system
7. Writing a paper

4. TEACHING METHODS--ASSESSMENT

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

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of biological databases. Use of ICT for bioinformatic analysis of the data of these databases.
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	33
Skills Development	6
Laboratory practice	26
Writing Laboratory Report	26
Study	34
Total	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.*	Oral final exam Oral presentation of the laboratory report

5. SUGGESTED BIBLIOGRAPHY:

James Watson, Tania Baker, Stephen Bell, Alexander Gann, Michael Levine, Richard Losick (2016), Molecular Biology of the Gene, Greek edition Edited by: Georgios Rodakis, Iosif Papamathaiakis, Utopia Publishing, ISBN-13: 978-618-81298- 2-5, Code in Eudoxos: 41960287.

6. TEACHERS:

Lectures
Styliani Chorianopoulou, Assistant Professor
Dimitris Bouranis, Professor

Laboratory exercises
Styliani Chorianopoulou, Assistant Professor
Dimitris Bouranis, Professor