

COURSE OUTLINE

1. GENERAL

SCHOOL	AGRICULTURAL AND FORESTRY SCIENCES		
DEPARTMENT	AGRICULTURAL DEVELOPMENT		
LEVEL OF STUDIES	MSc		
COURSE CODE	PAGR08	SEMESTER	2nd
COURSE TITLE	Special Topics in Plant Pathology		
TEACHING ACTIVITIES <i>If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>		TEACHING HOURS PER WEEK	ECTS CREDITS
Lectures		3	7.5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE <i>Background, General Knowledge, Scientific Area, Skill Development</i>	SPECIALIZATION		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	Yes		
COURSE URL:	https://eclass.duth.gr/courses/1426246/		

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The goal of the course is to provide postgraduate students with advanced knowledge on the broad area of Plant-Microbe Interactions. In particular, the course contains 13 thematic units (TH.U) dealing with **(i)** the molecular interactions between plants and pathogens (TH.U 1-4) **(ii)** the molecular physiology of non-parasitic diseases (TH.U 5) **(iii)** the molecular diagnosis of phytopathogenic microorganisms both in the laboratory but also in the field (TH.U 6) **(iv)** the composition, function and biotechnological applications of plant-colonizing beneficial microbes (TH.U 7-9) **(v)** the management of crop diseases based on the principles of the so-called integrated plant protection (IPP) (TH.U 10). In addition, this course provides knowledge and information on more general topics related to the plant quarantine, the impact of mycotoxins produced by plant-pathogenic fungi in food safety and the effects of the climate change on plant diseases (TH.U 11-13).

Upon successful completion of the course postgraduate students are expected to:

- acquire a comprehensive knowledge of the individual research areas of the science of Phytopathology as well as the methodologies and tools applied in basic and applied research.
- be able to understand, select and apply the appropriate molecular methodologies for the diagnosis of plant diseases.

- obtain knowledge on modern and innovative technologies in crop protection.
- be able to recommend integrated methodologies in crop protection.

General Skills

Name the desirable general skills upon successful completion of the module

*Search, analysis and synthesis of data and information,
ICT Use*

Adaptation to new situations

Decision making

Autonomous work

Teamwork

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project design and management

Equity and Inclusion

Respect for the natural environment

Sustainability

Demonstration of social, professional and moral responsibility and sensitivity to gender issues

Critical thinking

Promoting free, creative and inductive reasoning

- Autonomous work
- Literature search, data analysis and synthesis
- Development of inductive reasoning

3. COURSE CONTENT

1. TH.U 1. **The Science of Phytopathology.** Biotic and abiotic diseases of plants. Plant pathogenic fungi, oomycetes, bacteria, phytoplasmas, viruses and viroids. Milestones in the science of Phytopathology. Current challenges in basic and applied research. Innovations based on the significant progress that has been made in our understanding of the plant defense system.
2. TH.U 2. **Plant Pathogenic Microbes: Molecular Mechanisms of Pathogenesis.** Mechanisms of host recognition, signal transduction and regulation of gene expression in plant pathogens. Structure and function of microbial secretory systems. Conserved microbial patterns (MAMPS, Microbe-Associated Molecular Patterns) and effector proteins. Subcellular targets of microbial effectors. Host defense avoidance mechanisms.
3. TH.U 3. **Population Genetics of Phytopathogenic Microorganisms.** Genetic diversity and sources of genetic diversity. Analytical and experimental methodologies for assessing genetic diversity. The importance of microbial genomic analyses in plant protection.
4. TH.U 4. **Fundamental Research in Phytopathology.** Experimental methodologies and pathosystems, databases and holistic (-omics) technologies in the science of Phytopathology.
5. TH.U 5. **Molecular Physiology of Abiotic Stress.** Molecular mechanisms by which plants sense extreme environmental conditions. Hormonal regulation and changes that take place at the level of gene expression. Protective metabolites in abiotic stress. The importance of understanding the molecular mechanisms of abiotic stress in developing novel tools in crop protection.
6. TH.U 6. **Principles and Methods of Molecular Diagnosis of Plant Diseases.** Classical and modern techniques for the detection of phytopathogenic microorganisms in seeds and plant tissues. Laboratory equipment. Molecular diagnosis in the field. Modern holistic approaches (-omics) in plant disease diagnostics.
7. TH.U 7. **Prokaryotic Microbiomes of Plants.** Composition and function of the prokaryotic microbiota colonizing the various plant organs with emphasis on the epiphytic and endophytic bacteria of the root. Research methodologies.

8. TH.U 8. **Eukaryotic Microbiomes of Plants.** Composition and function of the eukaryotic microflora colonizing the various plant organs with emphasis on the beneficial rhizosphere fungi. Research methodologies.
9. TH.U 9. **Biotechnological Applications of the Plant Microbiomes.** Crop microbiome handling strategies. Plant microbiomes in the improvement of plant health. Plant microbiomes and sustainable agriculture. Biotechnological products of plant-associated beneficial bacteria(e.g., pharmaceutical compounds).
10. TH.U 10. **Plant Disease Management.** Integrated crop protection (principles and methodologies). Novel tools in the biological control of plant diseases.
11. TH.U 11. **Quarantine Phytopathogens.** Prokaryotic and eukaryotic pathogens subjected to quarantine regulations. Regulatory frameworks.
12. TH.U 12. **Mycotoxins.** The most important mycotoxins produced by phytopathogenic fungi. Mycotoxins in the food chain. Effects of mycotoxins on animal and human health. Mycotoxins as biological weapons. Control measures and the EU regulatory framework for the prevention of food contamination with mycotoxins.
13. TH.U 13. **Phytopathology and Climate Change.** Possible effects of climate change on the mechanisms of plant resistance, on the pathogenesis of phytopathogenic microbes and on the emergence of (new) diseases. Predictive models.
14. **Compulsory Assignments-Presentations.**
15. **Written exams.**

1. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD <i>Face to face, Distance learning, etc.</i>	In the classroom	
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	<ul style="list-style-type: none"> • Use of information technologies (power point, video) • Support of the learning process through the e-class online platform 	
TEACHING ORGANIZATION <i>The ways and methods of teaching are described in detail.</i> <i>Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.</i> <i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>	Activity	Semester workload
	Lectures	39
	Written assignment	100
	Self study	48,5
	Total	187,5
STUDENT EVALUATION <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others</i> <i>Please indicate all relevant information about the course assessment and how students are informed</i>	<p>– Written exams at the end of the semester</p> <p>– Literature review assignment</p> <p>Final grade (1+2):</p> <p>1. Written test: 7/10</p> <p>2. Review assignment: weighing 3/10</p>	

2. SUGGESTED BIBLIOGRAPHY

- The Arabidopsis Book
- Molecular Methods in Plant Disease Diagnostics (2016). Edited by Neil Boonham, Jenny Tomlinson, Rick Mumford
- Phyto-Microbiome in Stress Regulation (2021). Edited by Manoj Kumar, Vivek Kumar, Ram Prasad

Additional bibliographic resources will be available to students during the course

ANNEX OF THE COURSE OUTLINE

Alternative ways of examining a course in emergency situations

Teacher (full name):	Christos Zamioudis
Contact details:	czamioud@agro.duth.gr
Supervisors: (1)	YES
Evaluation methods: (2)	Remote exams via the "EXERCISES" of the E-class combined with simultaneous mandatory connection to the Skype for Business platform.
Implementation Instructions: (3)	<p>The date and time of the exams will be announced by the Secretariat of the Department. The Skype for Business (SfB) link will be provided by the instructor one to two days before the scheduled exam date. Eligible students should ensure that they are connected to the E-class platform. The examination of the course will be carried out via the EXERCISES of the E-class. Relevant instructions will be given and then the access to the EXERCISES entitled EXAMINATION TOPICS-DATE will be opened. Topics will include MULTIPLE-CHOICE SINGLE ANSWER QUESTIONS and/or MULTIPLE-CHOICE MULTIPLE-ANSWER QUESTIONS and/or MATCHING QUESTIONS (MATCH) and/or CORRECT-FALSE QUESTIONS. The time the students will have at their disposal will be on average 45 seconds for each question. In any case, it is up to the student to distribute the time as he/she wishes. The system will shut down automatically once the examination time is completed; after that, there is no possibility to submit the EXERCISE. Therefore, students are kindly requested to submit the EXERCISE on time. The available time is visible at the top of the EXERCISE page. When the attempt is completed, the EXERCISE is submitted by selecting "submit" at the bottom of the query page. Attention: there is only one attempt and there is no possibility of cancellation and restart. The SKYPE microphone remains muted throughout the exams; if there are questions or problems, the students are suggested to use the SfB chat. In order for the student to participate in the exams, he/she must read and accept the terms of his/her participation in the examination process. This can be done through the page https://students.duth.gr and from the menu "Service", by going to the option "Participation in the next exam period". The instructor will then attach before the examination date the list of student AEMs who are eligible to participate in the exams.</p>

- (1) Please write YES or NO
- (2) Note down the evaluation methods used by the teacher, e.g.
 - *written assignment* or/and exercises
 - written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.
- (3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:
 - a) in case of **written assignment and / or exercises**: the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and any other necessary information.

b) in case of **oral examination with distance learning methods**: the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.