SUSTAINABLE MANAGEMENT OF BIOTIC RESOURCES IN AGRICULTURE

COURSE OUTLINE

Responsible: Anastasia Tampakaki

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.7.021.0	**SEMESTER**	1st
COURSE TITLE	Sustainable Management of Biotic Resources in Agriculture		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Total	**4**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	Microbiology, Soil Microbiology, Research Methodology and Academic Writing in Agricultural Sciences
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/AGRO236/

2. LEARNING OUTCOMES

Learning outcomes

Upon successful completion of the course, students will be able to:

- understand the importance of the plant microbiome for plant growth, productivity, and health;
- acquire and retrieve useful information on the methodologies used in both modern and conventional methods of plant microbiome analysis;
- understand the importance of using microorganisms to improve soil fertility, enhance plant growth and nutrition, protect plants against diseases and pests, and increase plant tolerance to abiotic stresses such as drought and salinity;
- acquire knowledge of methods used for the management of rhizosphere microorganisms;
- identify the different categories of biofertilisers and microbial inoculants and understand their characteristics;
- understand the potential and challenges associated with the use of biofertilisers and microbial inoculants, and become familiar with the methods used for their development, production, and application in agriculture;
- acquire knowledge of the methods used for the commercial production of microbial inoculants;
- identify the different categories of microbial pesticides and understand their characteristics;
- understand the advantages and disadvantages of using microbial pesticides in sustainable agriculture;
- understand the importance of exploiting microorganisms in agricultural systems, environmental

applications, and the industrial-scale production of goods;
- record, present, and analyse original research results;
- combine and correlate original research results with relevant scientific literature to evaluate and interpret them and propose viable solutions for sustainable agriculture.

General Competences

- Search for, analyse and synthesise data and information using appropriate technologies.
- Adaptation to new situations.
- Decision-making.
- Independent work.
- Teamwork.
- Generation of new research ideas.
- Project planning and management.
- Respect for the natural environment.
- Promotion of free, creative and inductive thinking.

3. SYLLABUS

- The plant microbiome.
- The plant microbiome as a source of novel chemical compounds for the pharmaceutical, agricultural and biotechnology industries.
- Beneficial microorganisms in agriculture.
- Modern and classic methods of plant microbiome analysis.
- Biofertilisers and microbial inoculants: definitions, categories, advantages and disadvantages, and commercial products.
- Methods for the development, production and application of biofertilisers and microbial inoculants in plants. Limitations of biofertiliser technology and the relevant legislation.
- Microbial pesticides: biological control of plant pests and diseases through case studies.
- Applications of microorganisms for enhancing plant growth and development through case studies.
- Applications of microorganisms in plant nutrition through case studies.
- Enhancement of plant tolerance to abiotic stresses, such as drought and salinity, through the use of microorganisms and relevant case studies.
- Applications of microorganisms in the utilisation of plant residues through case studies.
- Biodegradation and bioremediation of agrochemicals in soil through case studies.
- Applications of other organisms in the management of agro-environmental systems.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	The course is delivered face-to-face through lectures in the lecture hall and practical sessions in the laboratory.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• PowerPoint presentations, digital videos and other audiovisual teaching materials. • Learning support through the HMU e-Class platform and online scientific databases. • Face-to-face, asynchronous communication through e-mail and e-Class, and synchronous communication through videoconferencing services such as e-Class, Zoom and Microsoft Teams.

TEACHING METHODS The manner and methods of teaching are described in detail.	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Practical Exercises</td><td>13</td></tr><tr><td>Coursework Preparation</td><td>13</td></tr><tr><td>Independent Study</td><td>60</td></tr><tr><td>Course total</td><td>125</td></tr></table>
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Assessment of the theoretical component is conducted in Greek and consists of: • evaluation of a written assignment and/or oral presentation, accounting for **40%** of the final grade; • mid-term examinations, accounting for **60%** of the final grade. The examinations include a combination of: • multiple-choice questions; • short-answer questions; • true/false questions; • matching questions.

5. ATTACHED BIBLIOGRAPHY

Greek-Language Textbooks

- Pepper, I., Gerba, C., & Gentry, T. (2025). *Environmental Microbiology*. A. Papazisis Publications.
- Madigan, M. T., Martinko, J. M., & Parker, J. (2018). *Brock Biology of Microorganisms*. University of Crete Press, Foundation for Research and Technology – Hellas.
- Dougyas, S., Aivazidis, A., & Melidis, P. (2012). *Environmental Microbiology*. Embryo Publications.

English-Language Textbooks

- Pepper, I., Gentry, T., Gerba, C., & Brooks, J. 2026. Environmental Microbiology (4th ed.) Academic Press.
- Gentry, T., Fuhrmann, J., & Zuberer, D. (2021). *Principles and Applications of Soil Microbiology* (3rd ed.). Elsevier.
- Verma, D. K. (Ed.). (2019). *Microbiology for Sustainable Agriculture, Soil Health, and Environmental Protection* (1st ed.). Apple Academic Press. https://doi.org/10.1201/9781351247061
- Channarayappa, C., & Biradar, D. P. (2018). *Soil Basics, Management and Rhizosphere Engineering for Sustainable Agriculture* (1st ed.). CRC Press. https://doi.org/10.1201/9781351044271
- Meena, V. S., Mishra, P. K., Bisht, J. K., & Pattanayak, A. (Eds.). (2017). *Agriculturally Important Microbes for Sustainable Agriculture*. Springer Singapore. https://doi.org/10.1007/978-981-10-5589-8
- Giri, B., Prasad, R., Wu, Q.-S., & Varma, A. (Eds.). (2019). *Biofertilizers for Sustainable Agriculture and Environment*. Springer Nature Switzerland. https://doi.org/10.1007/978-3-030-18933-4

Supplementary Literature

- Course notes and teaching materials for the lectures and practical exercises, available through the HMU e-Class asynchronous learning platform.