ERASMUS

HELLENIC MEDITERRANEAN UNIVERSITY

COURSE OUTLINES

Department of Agriculture

School of Agricultural Sciences

Academic Year 2026-2027

TABLE OF CONTENTS

GENETICS

COURSE OUTLINE

Responsible: Konstantinos Paschalidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.2.001.0	**SEMESTER**	1st
COURSE TITLE	Genetics		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	4
	1	1
Total	**4**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised Background Course
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://iro.hmu.gr/genetics-agriculture/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

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

- understand the fundamental principles of heredity, the inheritance and expression of genetic traits, the interaction between genotype and environment, and the chemical nature of the genetic material;
- solve inheritance problems and interpret patterns of genetic variation;
- recognize the distinctive characteristics of plant inheritance and explain the genetic features of plants;
- understand modern methods of genetic engineering and biotechnology, together with their applications, limitations, and associated ethical and practical considerations.

General Competences

Generic Competences

Students will also develop the ability to:

- search for, analyse and synthesize data and information using appropriate technologies;
- make informed decisions;

- generate new research ideas;
- promote free, creative and inductive thinking.

3. SYLLABUS

COURSE CONTENT

Theoretical Syllabus

- The concept of heredity. Historical development of genetics. Fundamental genetic concepts.
- Chromosomes and cell division. The processes and biological significance of mitosis and meiosis in the transmission of hereditary characteristics.
- Principles of inheritance. Segregation of simple traits and Mendelian ratios. Monohybrid and dihybrid inheritance.
- Genotype and environment. Phenotype as the result of genotype–environment interaction. Multiple alleles, mutations and epistasis.
- Sex chromosomes and sex-linked inheritance. Genetic linkage, linkage groups and genetic mapping.
- The chemical nature of the genetic material. DNA and RNA. Transcription, the genetic code and translation.
- Changes in chromosome number (polyploidy) and chromosomal abnormalities.
- Genetic engineering and recombinant DNA technology. Techniques and molecular tools used in genetic cloning and genetic modification of organisms.

Practical Exercises

- Cell growth and cell division: mitosis and meiosis (microscopic observations, images and practical exercises).
- Monohybrid and dihybrid inheritance. Calculation and interpretation of Mendelian segregation ratios.
- Multiple alleles. Demonstration and interpretation of the ABO blood group system.
- Mutations and their genetic consequences.
- Genetic linkage and recombination. Numerical exercises and application of the chi-square (χ^2) test in genetic analysis.
- Sex-linked inheritance: principles and problem-solving exercises.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Teaching Method: Face-to-face teaching 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	**Use of Information and Communication Technologies (ICT)** • PowerPoint presentations and audiovisual teaching material. • Course support through the HMU e-Class platform. • Communication with students via the e-Class platform and e-mail.

TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	Semester workload
Lectures	39
Practical/Laboratory Exercises	13
Coursework Assignments	23
Independent Study	50
Course total	**125**

STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Student Assessment

Lectures are delivered in Greek. For international (Erasmus) students, both teaching support and assessment can be provided in English. Assessment of the theoretical component is based on a **final written examination (100%)**. The examination may include:

- True/False questions;
- Matching questions;
- Multiple-choice questions;
- Short-answer questions;
- Essay-type questions;
- Completion of labels or terms in diagrams;
- Problem-solving and interpretation questions.

Students may also undertake an **optional coursework assignment**. Assessment of the practical component is integrated into the overall course assessment and includes written and/or oral evaluation through practical exercises, problem-solving tasks, and questions requiring critical thinking and application of genetic principles.

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

Main Textbooks

- Russell, P. J. (2020). *iGenetics: A Mendelian Approach* (2nd Greek Edition). Academic Publications I. Basdra & Co.
- Imsiridou, A. Th. (2025). *Techniques of Genetic Analysis*. Barbounakis Publications.
- Michail, L. G. (2017). *Introduction to Genetics*. UniBooks.
- Hartwell, L. H., Goldberg, M. L., Fischer, J. A., & Hood, L. (2024). *Genetics: From Genes to Genomes* (Greek Edition). Utopia Publications.

Supplementary References

- Anastasopoulos, H., Voutsina, A., Georgakopoulos, D., Zampalou, S., Leivadaras, G., Pavlikaki, C., Tambakaki, A., & Fanouraki, M. (2001). *Genetics Laboratory Notes*. Hellenic Mediterranean University.
- Trantas, E. (2024). *Plant Breeding Laboratory Manual*. Kallipos – Open Academic Editions.
- Tokatlidis, I. (2023). *Plant Breeding*. Kallipos – Open Academic Editions.
- Brooker, R. J. (2023). *Genetics: Analysis and Principles*. McGraw-Hill Education.

RESEARCH METHODOLOGY AND ACADEMIC WRITING IN AGRICULTURAL SCIENCES

COURSE OUTLINE

Responsible: Filippos Ververidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.2.002.0	**SEMESTER**	2nd
COURSE TITLE	Research Methodology and Academic Writing in Agricultural Sciences		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	5
Total	**0**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	General background
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/AGRO130/

2. LEARNING OUTCOMES

Learning outcomes

Learning Outcomes

The aim of this course is to provide students with the fundamental knowledge and practical skills required to understand and effectively communicate scientific research to an academic audience. This course emphasizes the concept of **student-centred learning**, which aligns with the **European Higher Education Area (EHEA)** philosophy. Moreover, explicitly incorporates competencies such as **critical thinking**, **scientific reasoning**, and **communication to specialist and non-specialist audiences**, which are now considered core learning outcomes in most Erasmus curricula.

Why this course?

Science is more than the accumulation of knowledge—it is a way of thinking. **Research Methodology and Academic Writing in Agricultural Sciences** introduces students to the principles through which scientific knowledge is generated, validated, communicated, and critically evaluated.

The course is designed to transform students from passive recipients of information into active researchers who are capable of formulating research questions, designing experiments, analysing scientific evidence, and communicating research findings effectively and ethically. Particular emphasis is placed on developing the analytical, critical, and communication skills required for modern agricultural research.

The course is structured into two complementary modules.

Module A. Research Methodology

This module focuses on the scientific method and the principles of research design in Agricultural Sciences. Students develop an understanding of how scientific knowledge is generated and validated through systematic investigation.

By the end of this module, students will be able to:

- formulate clear and scientifically relevant research questions and hypotheses;
- distinguish between different types of scientific research and select appropriate methodological approaches;
- understand the ethical principles governing scientific research, including research integrity and responsible conduct;
- design experiments that ensure scientific validity, reliability, and reproducibility;
- select appropriate methods for data collection, recording, organization, and preparation;
- understand the principles of experimental design and quality assurance in scientific research;
- prepare datasets for descriptive and inferential statistical analysis; and
- use statistical software packages (e.g. SPSS) to analyse and interpret experimental data.

Students are also introduced to the fundamental principles of statistics as an essential tool for scientific reasoning rather than merely a computational procedure. Descriptive statistics are presented as methods for organizing and summarizing data, whereas inferential statistics are introduced as tools for hypothesis testing and evidence-based decision-making using statistical procedures such as the *t*-test and Analysis of Variance (ANOVA). Particular emphasis is placed on understanding **why** statistical methods are applied, **when** they are appropriate, and **how** statistical outcomes should be interpreted within a scientific context.

Module B. Academic Writing and Scientific Communication

The second module focuses on the communication of scientific knowledge through academic writing and oral presentation.

Students develop practical skills in:

- searching, retrieving, and critically evaluating scientific literature using international bibliographic databases;
- synthesizing scientific evidence from multiple sources;
- preparing scientific manuscripts according to internationally accepted academic writing standards, including undergraduate dissertations, postgraduate theses, and research articles;
- designing and delivering effective scientific presentations for conferences, seminars, and other academic events.

As an integral part of the course, students may participate in a **simulated scientific conference**, where each student assumes the role of a conference delegate and presents an individual scientific contribution. This experiential learning activity provides authentic experience in scientific communication while familiarizing students with the organization and professional standards of scientific conferences.

Through this process, students gain experience in:

- presenting scientific work to an academic audience;
- responding to questions and participating in scientific discussion;
- communicating research findings clearly and confidently; and
- applying the principles of research integrity and academic ethics throughout the scientific communication process.

Students are encouraged to select research topics that reflect their own academic interests within Agricultural Sciences, promoting initiative, independent learning, critical thinking, and creative engagement with contemporary scientific literature.

Learning Outcomes

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

- formulate scientifically sound research questions and design experiments using appropriate methodologies;
- select suitable techniques for data collection, management, and statistical analysis;
- critically evaluate the validity, reliability, and significance of scientific findings;
- interpret experimental results using appropriate statistical approaches;
- retrieve, analyse, synthesize, and critically evaluate scientific literature from international databases;
- prepare scientific manuscripts following internationally accepted standards of academic writing;
- communicate scientific findings effectively through professional oral presentations and scientific discussion;
- apply the principles of research integrity, academic ethics, and responsible scientific communication throughout the research process.

Intended Audience

This course is intended for undergraduate students enrolled in the Agricultural Sciences programme who wish to develop a solid foundation in scientific research methodology and academic communication. It is particularly valuable for students planning to pursue postgraduate studies or careers in research, innovation, agricultural consultancy, or any professional field requiring the critical evaluation and interpretation of scientific data.

The course serves as a bridge between theoretical knowledge and the production of new scientific knowledge. Rather than simply teaching students **how to write a scientific paper**, it develops the mindset, analytical skills, and scientific reasoning expected of modern researchers, preparing them to move from understanding existing knowledge to contributing to its advancement.

General Competences

Generic Competences

Upon successful completion of the course, students are expected to have developed the ability to:

- search for, retrieve, critically evaluate, analyse, and synthesize scientific data and information using appropriate digital technologies and scientific databases;
- make informed and evidence-based decisions;
- adapt effectively to new scientific challenges and learning environments;
- plan, organize, and manage individual and collaborative projects;
- work independently with responsibility and initiative;
- collaborate effectively as members of multidisciplinary teams;
- generate innovative research ideas and formulate scientific hypotheses;
- demonstrate creativity, critical thinking, and inductive reasoning in the analysis and interpretation of scientific evidence.

3. SYLLABUS

Course Content

The course combines theoretical instruction with experiential learning through the organization of a **simulated scientific conference**, in which students actively participate as conference delegates. During the first five weeks, students receive the theoretical background and practical guidance required to prepare, write, and present an individual scientific paper. The remaining part of the course is devoted to the preparation, presentation, discussion, and evaluation of student presentations.

Module A. Research Methodology

This module introduces the fundamental principles of scientific research and experimental design in Agricultural Sciences. Topics include:

1. **Introduction to Scientific Research**
   - Scientific inquiry and the research process
   - Types of scientific research
   - Formulation of research questions and hypotheses
2. **Research Ethics and Academic Integrity**
   - Principles of responsible research conduct
   - Academic integrity
   - Plagiarism: prevention, detection, and good scientific practice
   - Ethical use of Artificial Intelligence (AI) in scientific research and academic writing
3. **Scientific Information Retrieval**
   - Literature search strategies
   - Scientific databases (Scopus, Web of Science, PubMed, Google Scholar, etc.)
   - Effective use of keywords, Boolean operators, and citation tracking
   - Critical evaluation of scientific sources
4. **Research Methodology and Scientific Evaluation**
   - Structure of scientific research
   - Critical appraisal of scientific publications
   - Principles of peer review
   - Evaluation of scientific evidence
5. **A brief overview of Experimental Design and Basic Statistical Concepts**
   - Purpose and principles of experimentation
   - Introduction to Analysis of Variance (ANOVA)
   - Completely Randomized Designs (single-factor and factorial experiments)
   - Randomized Complete Block Designs
   - Interpretation of experimental results

Module B. Academic Writing in Agricultural Sciences

This module develops the practical skills required for preparing and communicating scientific work according to internationally accepted academic standards.

Topics include:

1. **Preparation of Scientific Communications**
   - Types of scientific presentations (conference papers, invited lectures, seminars, workshops)
   - Organization and operation of scientific conferences
   - Student participation in a simulated scientific conference
2. **Literature Search and Information Management**
   - Accessing scientific literature through the Hellenic Mediterranean University Library
   - Comparative use of major bibliographic databases
   - Efficient literature searching using Google Scholar and scientific databases
   - Reference management and citation practices
3. **Scientific Writing**
   - Structure of a scientific paper (Title, Abstract, Introduction, Materials and Methods, Results, Discussion, Conclusions)
   - Writing style and scientific language

- Preparation and organization of scientific manuscripts
- Collaborative writing exercises

4. **Artificial Intelligence in Academic Writing**
   - Appropriate use of AI tools in scientific writing
   - Opportunities and limitations of generative AI
   - Responsible AI use and transparency
   - Strategies for avoiding plagiarism and maintaining academic integrity
5. **Preparation of Oral Presentations**
   - Principles of effective scientific communication
   - Presentation design
   - Public speaking techniques
   - Responding to questions and scientific discussion
6. **Scientific Presentation Design**
   - Development of professional PowerPoint presentations
   - Design principles for scientific slides
   - Effective use of figures, tables, graphs, and animations
   - Presentation of scientific data following international conference standards

Practical Component

Throughout the semester, students prepare an individual scientific paper based on a topic within the field of Agricultural Sciences. Under the supervision of the course instructor, they conduct a comprehensive literature review, prepare a scientific manuscript, and present their work orally during the simulated scientific conference. The presentation is followed by scientific discussion and constructive peer feedback, providing students with authentic experience in academic communication and scientific dissemination.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Mode of Delivery - The course is delivered through a combination of interactive lectures, experiential learning, problem-based learning, and student-centred activities.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Use of ICT in teaching, laboratory education, communication with students

Teaching and Learning Methods

The course is delivered through a combination of **interactive lectures**, **experiential learning**, **problem-based learning**, and **student-centred activities**.

Each four-hour weekly session is divided into two complementary components:

• **Theoretical Component:** The first half of each session consists of interactive lectures supported by PowerPoint presentations, multimedia resources, practical examples, and open classroom discussion. Students are encouraged to actively participate by relating theoretical concepts to real-world examples and their own academic experiences. Particular emphasis is placed on developing students' confidence in scientific communication and public speaking.

• **Practical Component:** The second half of each session is devoted to experiential learning activities, including individual and group exercises, case studies, literature analysis, scientific writing workshops, data interpretation, and preparation of oral presentations. These activities allow students to apply the concepts introduced during the lectures in an authentic research-oriented environment.

The course also incorporates the organization of a **simulated scientific conference**, during which students present their own scientific work and participate in scientific discussion, providing valuable experience in academic communication and peer interaction.

Use of Information and Communication Technologies (ICT)

Teaching is supported through the use of modern digital technologies, including:

• PowerPoint presentations;

• multimedia educational resources and videos;

• online scientific databases and bibliographic search tools;

• statistical software demonstrations (e.g. SPSS);

• Artificial Intelligence (AI) tools for academic writing and scientific communication, with emphasis on their ethical and responsible use;

• the University's **e-Class** learning management system for asynchronous learning, communication, distribution of educational material, assignment submission, and continuous interaction between students and the instructor.

Teaching Activities (See below)

TEACHING METHODS

The manner and methods of teaching are described in detail.

Activity	**Semester workload**
Lectures and interactive classroom discussion	44
Experiential learning activities and practical workshops	22
Literature search and independent study	18
Preparation of scientific manuscript	18
Preparation of oral presentation	12
Study for examinations	11
Course total	**125**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	**Student Assessment** The language of instruction and assessment is **Greek**. Student performance is assessed through a combination of formative and summative assessment methods. Assessment may include: • **Final written examination** (mandatory); • **Optional mid-term assessments**, which may contribute up to **40%** of the final grade, provided that students choose to participate. The number, content, and weighting of these assessments are announced at the beginning of each academic semester; • evaluation of students' ability to analyse scientific problems, critically interpret research findings, and apply scientific reasoning. Written examinations may include a combination of: • multiple-choice questions; • true/false questions; • matching exercises; • short-answer questions; • problem-solving exercises; • case-study analysis. Assessment is designed to evaluate not only students' knowledge and understanding of the course material but also their critical thinking, analytical reasoning, problem-solving ability, and capacity to apply scientific methodology in real-world agricultural contexts.

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED READING (in chronological order)

- Thomas C.G., **2021**. “Research Methodology and Scientific Writing”, Second Edition. Kerala Agricultural University
- Thrissur, Kerala, India, Springer. ISBN 978-3-030-64864-0, https://doi.org/10.1007/978-3-030-64865-7.
- Hall G.M., 2001. “How to present at Meetings”, BMJ Books London, σελ. 79.
- Peat J., Elliot E., Baur L, and Keena V., 2002. “Scientific writing. Easy when you know how”, BMJ Books London, σελ. 292.

PLANT PHYSIOLOGY

COURSE OUTLINE

Responsible: Konstantinos Loulakakis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.3.001.0	**SEMESTER**	1st
COURSE TITLE	Plant Physiology		

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

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/AGRO152/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

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

- understand the fundamental physiological processes governing plant growth and development;
- explain the relationships between plant structure and function at the cellular, tissue and whole-plant levels;
- understand the mechanisms of water and mineral uptake, transport and distribution within plants;
- explain the physiological basis of photosynthesis, respiration and plant metabolism;
- understand the role of plant hormones in regulating growth, differentiation and development;
- evaluate the effects of environmental factors on plant physiological processes;
- interpret experimental results and apply physiological principles to agricultural production and crop management.

General Competences

Generic Competences

Students will develop the ability to:

- search for, analyse and synthesize scientific information using appropriate technologies;
- work independently;
- make informed scientific decisions;
- apply critical thinking to biological problems;
- promote free, creative and inductive thinking.

3. SYLLABUS

COURSE CONTENT

Theoretical Syllabus

- Plant cells and their physiological organization.
- Water relations in plants. Water potential, absorption, transport and transpiration.
- Mineral nutrition and nutrient uptake.
- Photosynthesis: light reactions, carbon fixation and environmental regulation.
- Respiration and energy metabolism.
- Transport of assimilates through the phloem.
- Plant growth and development.
- Plant hormones and growth regulators.
- Seed dormancy and germination.
- Flowering, fruit development and senescence.
- Plant responses to abiotic and biotic environmental factors.
- Physiological basis of crop productivity.

Laboratory Exercises

- Microscopic observation of plant tissues.
- Measurement of transpiration.
- Photosynthesis experiments.
- Determination of chlorophyll content.
- Osmosis and water potential experiments.
- Plant growth regulator demonstrations.
- Germination experiments.
- Interpretation of physiological data.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Teaching Method: Face-to-face teaching through lectures and laboratory sessions.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	**Use of Information and Communication Technologies (ICT)** • PowerPoint presentations. • Audiovisual teaching material. • Support through the HMU e-Class platform. • Communication with students via e-Class and e-mail.

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>Laboratory Exercises</td><td>26</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	**Student Assessment** Teaching is delivered in Greek, while English-language support and assessment are available for international (Erasmus) students. Assessment consists of: • Final written examination for the theoretical component. • Continuous assessment of laboratory performance. • Written and/or oral evaluation of laboratory exercises. • Problem-solving questions and interpretation of experimental results.

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

Main Textbooks

- Taiz, L., Zeiger, E., Moller, I. M., & Murphy, A. *Plant Physiology and Development*.
- Hopkins, W. G., & Huner, N. P. A. *Introduction to Plant Physiology*.

Supplementary References

Additional scientific articles, laboratory notes and educational material are provided through the HMU e-Class platform.

SOIL SCIENCE

COURSE OUTLINE

Responsible: Vasileios Tzanakakis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.3.005.1	**SEMESTER**	1st
COURSE TITLE	Soil science		

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

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised Background Course
PREREQUISITE COURSES	Recommended: Agricultural Chemistry, Biochemistry
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

Upon successful completion of the course, students will have acquired the necessary knowledge of:

- the fundamental characteristics and properties of soils, including their inorganic and organic components, as well as their main physical and chemical properties;
- the importance of these properties for supporting plant production and protecting soil resources and the environment;
- soil genesis, soil development, and soil classification.

General Competences

In addition to their theoretical training, students participate in laboratory activities aimed at developing competencies in:

- evaluating the results of soil analyses related to soil properties and fertility;
- decision-making;
- independent work;
- teamwork;
- working in an interdisciplinary environment;
- generating new research ideas;
- demonstrating social, professional and ethical responsibility, as well as sensitivity to gender issues;

- critical thinking and self-evaluation;
- promoting free, creative and inductive thinking.

3. SYLLABUS

Theoretical Syllabus

I. Inorganic Soil Components

Description of minerals and rocks and their weathering processes. Description of clay minerals.

II. Organic Soil Components

Description of soil organic matter and the (bio)chemical processes involved in its transformation.

III. Soil Water and Soil Air

Water retention forces, soil water-holding capacity, and the principles governing water and air movement within the soil profile.

IV. Physical and Chemical Properties of Soil

Basic soil properties including:

- soil texture;
- soil structure;
- soil consistency;
- bulk density and particle density;
- porosity;
- soil colour.

In addition, the following topics are covered:

- ion exchange;
- soil pH;
- base saturation;
- buffering capacity;
- soil redox properties;
- soil salinity and sodicity.

V. Soil Genesis and Development

Description of soil-forming processes and the major factors influencing soil formation and evolution.

VI. Soil Classification

Description of the principal soil classification systems, including the **US Soil Taxonomy** and the **FAO–UNESCO Soil Classification System**.

Laboratory Exercises

- Soil sampling.
- Handling and preparation of soil samples in the laboratory.
- Determination of soil particle-size distribution (soil texture).
- Determination of equivalent and active calcium carbonate in soils.
- Determination of soil organic matter.
- Determination of soil pH and salinity.
- Determination of plant-available potassium and phosphorus in soils.
- Principles of soil mapping and soil classification.

<table>
<tr><th colspan="2">4. TEACHING and LEARNING METHODS - EVALUATION</th></tr>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Teaching Method Theory Face-to-face lectures. Laboratory Each laboratory session begins with an explanation of the methodology for the practical exercise, followed by supervised hands-on training under the guidance of the instructor.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of Information and Communication Technologies (ICT)
• PowerPoint presentations and other audiovisual teaching materials.
• Learning support through the HMU e-Class platform.
• Communication with students via the e-Class platform and e-mail.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>ctivity Semester Workload (hours) Lectures 39 Laboratory Sessions 26 Independent Study 60</td><td>125</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure</td><td>Student Assessment
Theory
Assessment consists of:
• written in-class quizzes following each lecture, including multiple-choice and essay questions selected from a question bank (providing up to 1–2 bonus marks added to the final written examination);
• final written examination.
Laboratory
Assessment is based on:
• individual laboratory assignments (20% of the final laboratory grade);
• mid-term written progress examinations (30%);
• final written laboratory examination (50%).</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

- Brady, N. C., & Weil, R. R. (2011). *The Nature and Properties of Soils* (Greek Edition). Embryo Publications.
- Sinanis, K. N. (2018). *Soil: Management and Environment*. Psyhalos Publications.
- Sinanis, K. N. (2003). *Laboratory Exercises in Soil Management*. Technological Educational Institute of Heraklion.
- Sinanis, K. N. (2008). *Laboratory Exercises in Soil Science*. Technological Educational Institute of Heraklion.

FIELD CROP PRODUCTION I (GRAMINEAE AND LEGUMINOSAE)

COURSE OUTLINE

Responsible: Konstantinos Paschalidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.3.006.0	**SEMESTER**	1st
COURSE TITLE	Field Crop Production I (Gramineae and Leguminosae)		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	3
	2	2
Total	**5**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://iro.hmu.gr/agriculture-english-courses/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

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

- identify the major winter and spring cereal species as well as grain and forage legumes, and understand their basic morphology and physiology;
- understand the fundamental cultivation practices and determine the factors affecting their implementation and effectiveness;
- develop and apply laboratory skills for evaluating the sowing and quality value of seed;
- understand the effects of biotic and abiotic factors on crop yield formation.

General Competences

Generic Competences

- Search for, analyse and synthesize data and information using appropriate technologies.
- Decision-making.

- Independent work.

3. SYLLABUS

COURSE CONTENT

Theoretical Syllabus

The course presents the production systems of field crops and examines the characteristics of the soil and aerial environment, general crop management practices, and indicators used for evaluating agricultural production.

For each cultivated species, the following topics are covered:

- geographical distribution, importance and economic significance;
- botanical classification, morphology, biology and adaptability;
- yield formation (growth stages and yield components);
- pests and diseases: symptoms and crop protection, with emphasis on preventive measures (resistant varieties, crop rotation, etc.);
- cultivation practices (crop rotation, tillage, fertilisation, sowing, weed control and irrigation);
- harvesting, storage, quality characteristics and utilization of products for human and animal nutrition;
- production improvement practices, varieties and hybrids.

For **leguminous crops**, particular emphasis is placed on the **symbiotic biological nitrogen fixation** process.

Laboratory Exercises

- Cultivation practices (crop rotation, tillage, fertilisation, sowing, weed control and irrigation).
- Evaluation of seed quality and sowing value.
- Harvesting, storage and quality characteristics of agricultural products.
- Varieties and hybrids of field crops.

The laboratory focuses on:

- **Winter cereals:** wheat, barley, oats, rye and triticale.
- **Spring cereals:** maize, rice, sorghum and millet.
- **Leguminous crops:** grain legumes and forage legumes.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Teaching Method: Face-to-face teaching 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	**Use of Information and Communication Technologies (ICT)** • PowerPoint presentations and audiovisual teaching material. • Learning support through the HMU e-Class platform. • Communication with students via the e-Class platform and e-mail.

TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	Semester workload
Lectures	39
Laboratory Exercises	26
Independent Study	60
Course total	**125**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	**Student Assessment** Lectures and assessment are conducted in Greek (and in English for international/Erasmus students). **Theory** Assessment is based on a final written examination. **Laboratory** Assessment is based on: • individual laboratory assignments (20%); • laboratory quizzes/tests (80%).

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

- Papakosta-Tasopoulou, D. (2012). *Special Crop Production – Cereals and Legumes*. Synchroni Paideia Publications, Thessaloniki.
- Grammatikaki, G. (2008). *Special Crop Production – Winter Cereals*. Lecture Notes, TEI of Crete, Heraklion.
- Grammatikaki, G. (2008). *Special Crop Production – Spring Cereals*. Lecture Notes, TEI of Crete, Heraklion.
- Grammatikaki, G. (2008). *Special Crop Production – Legumes*. Lecture Notes, TEI of Crete, Heraklion.
- Bilalis, D., Papastylianou, P.-T., & Travlos, E. S. (2018). *Field Crops*. Pedio Publications.
- Kulp, K., & Ponte, G. J. (2000). *Handbook of Cereal Science and Technology*. Marcel Dekker.
- Smith, C. W., & Dilday, R. H. (2003). *Rice: Origin, History, Technology, and Production*. John Wiley & Sons.
- Smith, C. W., Betran, J., & Runge, E. C. A. (2004). *Corn: Origin, History, Technology, and Production*. John Wiley & Sons.

AGRICULTURAL HYDRAULICS

COURSE OUTLINE

Responsible: Ioannis Daliakopoulos

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.4.005.0	**SEMESTER**	2nd
COURSE TITLE	Agricultural Hydraulics		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	3
Practice Exercises	1	1
Laboratory Exercises	1	1
Total	**5**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/TGH245/

2. LEARNING OUTCOMES

Learning outcomes

The aim of the course is for students to acquire comprehensive knowledge regarding irrigation, to be able to identify and connect irrigation components, and to understand the relationship between the quantity and quality of irrigation water and the type of plant, the soil quality, and the irrigation method and dose. Furthermore, through the irrigation course, students gain the ability to carry out complete irrigation studies.

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

- Calculate the water requirements of crops
- Calculate and measure soil moisture conditions and the hydraulic characteristics of the soil
- Have a basic knowledge of the quality characteristics of irrigation, mainly regarding electrical conductivity and the leaching fraction
- Identify all the components of an irrigation network and know their use and assembly/connection
- Calculate the linear and local (friction and minor) losses in an irrigation network
- Have a basic knowledge of selecting and installing the appropriate irrigation systems (surface irrigation methods, sprinkler irrigation, micro-irrigation)
- Be able to carry out an irrigation study

General Competences

- Search for, analysis and synthesis of data and information, using the necessary technologies as well
- Decision-making
- Project planning and management
- Autonomous (independent) work
- Teamwork
- Promotion of free, creative and inductive thinking

3. SYLLABUS

Soil and soil moisture: The hydraulic characteristics and the methods for determining them in different types of soils and substrates are examined.

Crop water requirements: The methods for determining irrigation requirements through the calculation of crop evapotranspiration are examined, with emphasis on the FAO-56 method.

Irrigation quantity/frequency: The correlation of the above with respect to the interval, dose and method of irrigation is examined.

Irrigation methods: The various irrigation systems (surface methods, sprinkler, micro-irrigation), the selection criteria and the installation methods are examined.

Hydraulic parameters: Methods for calculating the linear and local losses of irrigation networks are examined.

Components: A demonstration is carried out of components for quick-coupling portable and permanent irrigation networks from different materials. The use of special fittings, water intakes, filters, irrigation networks, fertilizer injectors, polyethylene components, drippers and sprinklers is also taught.

Assembly/connection: A walk is taken around the farm, where most of the above components are already connected and in full operation. Upon the students' return to the laboratory, they are asked to connect and disconnect sections of various irrigation networks.

Irrigation study: Solving exercises on irrigation studies.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face. The theory is taught in the form of lectures using audiovisual teaching aids, while the laboratory is taught through demonstration, practical exercises and the participation of students in the presentation of the course.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Projection of electronic slides. Support of the learning process through the e-class electronic platform.
TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	Semester workload
Lectures	39
Practice Exercises	13
Laboratory Exercises	13
Study	60
Course total	**125**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	The assessment is conducted in Greek and English (for ERASMUS students). Theory: Assessment is carried out through (a) intermediate written examinations on multiple-choice questions from a question bank and problem-solving, and/or assignments (30% of the final grade), and (b) a final examination (70% of the final grade). Laboratory: Assessment is carried out through (a) 2 group laboratory assignments (50% of the final grade), and (b) written examinations (50% of the final grade). The assessment criteria are explicitly specified in the introductory lecture and in the corresponding slides on e-class.

5. ATTACHED BIBLIOGRAPHY

- Παπαμιχαήλ Δημήτρης, Μπαμπατζιμόπουλος Χρήστος, Εφαρμοσμένη Γεωργική Υδραυλική, Εκδόσεις Ζήτη Πελαγία & Σια Ι.Κ.Ε. (ΕΥΔΟΞΟΣ: 41960118)
- Αλέξανδρος Πουλοβασίλης, Εισαγωγή στις Αρδεύσεις, Εκδόσεις ΕΜΒΡΥΟ (ΕΥΔΟΞΟΣ: 86200480)
- Eisenhauer, D. E., Martin, D. L, Heeren, D. M. & Hoffman, G. J. (2021). Irrigation Systems Management, ASABE. doi:10.13031/ISM.2021, CC
- Theory and laboratory notes, laboratory list of the components

AGRICULTURAL ORGANIC WASTE MANAGEMENT

COURSE OUTLINE

Responsible: Thrasyvoulos Manios

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.5.003.0	**SEMESTER**	1st
COURSE TITLE	Agricultural Organic Waste Management		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	5
Total	**0**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/TGH190/

2. LEARNING OUTCOMES

Learning outcomes

The course aims to present and familiarise students with modern techniques for processing the various organic residues and liquid wastes produced by agricultural and livestock production, as well as by related agro-industrial units. It also aims to highlight the optimal way in which non-agricultural wastes (urban effluent) can be utilised in agricultural production. The technologies and processes taught aim at: a) addressing the environmental impacts and problems caused by these wastes and effluents, and b) the ways in which the products of their treatment can be utilised in agriculture. After successful completion of the course, students will be able to:

For composting

- How to compost an organic solid residue or mixtures of residues
- All the required preparations of the residues (shredding, moisture, C/N ratio, etc.)
- Assessment of the progress of composting on the basis of temperature and other parameters
- Laboratory and agronomic evaluation of the compost produced
- The design, organisation, costing and operation of a composting unit for one or more organic residues of known quantities

For anaerobic digestion

- Which materials are suitable for biogas production
- Assessment of the progress of the process on the basis of specific parameters (biogas, pH, VFAs, etc.)

- The initial design, organisation and operation of an anaerobic digestion unit for one or more organic residues

For the treatment and reuse of wastewater for irrigation

- The degree of treatment required for water reuse
- Evaluation of the quality characteristics of the reclaimed water in relation to its effects on crops
- The possibilities of utilising reclaimed water as supplementary fertilisation of crops

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technologies
- Decision-making
- Adaptation to new situations
- Project planning and management
- Teamwork
- Promotion of free, creative and inductive thinking
- Respect for the natural environment

3. SYLLABUS

For composting

The theory is taught in the form of lectures using audiovisual teaching aids, while the laboratory is conducted through demonstration and practical application of the entire composting process and of the laboratory methods for determining the various composting parameters.

For anaerobic digestion

The theory is taught in the form of lectures using audiovisual teaching aids, while the laboratory is conducted through demonstration and practical application of the entire anaerobic digestion process and of the laboratory methods for determining the various parameters.

For the treatment and reuse of liquid wastes

The theory is taught in the form of lectures using audiovisual teaching aids, while the laboratory is conducted through demonstration and practical application of the entire treatment and reuse process and of the laboratory methods for determining its various parameters.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	**ORGANISATION** Activity | Semester Workload
TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	Semester workload
Lectures	36
Laboratories	29
Study	60
Course total	**125**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Written examinations 80% and assignments 20%, and for the laboratory, written examinations 60% and oral examinations 40%.

5. ATTACHED BIBLIOGRAPHY

SOIL MICROBIOLOGY

COURSE OUTLINE

Responsible: Anastasia Tampakaki

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.6.007.0	**SEMESTER**	2nd
COURSE TITLE	SOIL MICROBIOLOGY		

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 Science, Biochemistry, Molecular Biology and Biotechnology
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/AGRO217/

2. LEARNING OUTCOMES

Learning outcomes

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

- understand the importance of microorganisms in soil and remain informed about recent developments in soil microbiology;
- understand the contribution of microorganisms to soil fertility and the factors determining soil health, and learn how to maintain healthy soils within the framework of sustainable agriculture;
- acquire useful knowledge of the taxonomic, physiological and environmental characteristics of soil microorganisms;
- understand the roles of microbial populations in soil, including the decomposition of dead organic matter, enrichment of soil with nutrients, enhancement of water infiltration and improvement of soil structure;
- distinguish between harmful and beneficial soil microorganisms and understand how to suppress or promote them, respectively;
- understand the types of interactions occurring among microorganisms, such as symbiotic nitrogen fixation, mycorrhizal associations and competition, as well as interactions between microorganisms and other organisms, particularly plants;
- understand the metabolic processes through which microorganisms affect the productivity, quality and functioning of the soil ecosystem;
- develop skills in applying techniques and methodologies for the isolation, characterisation and identification

of soil microorganisms;
- understand and interpret data in the field of soil microbiology and develop skills in the oral and written presentation of research data and measurements;
- strengthen their ability to perform professional duties in agricultural and environmental science-related fields.

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

- Introduction to soil microbiology and its historical development.
- The soil and rhizosphere microbiome.
- Soil microorganisms: bacteria, archaea, fungi, viruses and protists.
- Metabolic diversity of soil microorganisms.
- Microbial nitrogen metabolism in soil:
  - ammonification;
  - nitrification;
  - denitrification;
  - symbiotic and non-symbiotic nitrogen fixation.
- Microbial metabolism of sulphur, phosphorus, iron and other elements in soil.
- Microbial interactions in soil:
  - symbiosis;
  - competition;
  - microbial communication.
- Interactions between plants and soil microorganisms:
  - the rhizosphere;
  - the spermosphere;
  - plant–microorganism communication.
- Soil microorganisms promoting plant growth and health.
- Methods for determining and analysing microbial diversity in soil.

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.

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• 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 via e-mail and e-Class, and synchronous communication through videoconferencing services such as e-Class, Zoom and Microsoft Teams.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.</td><td><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>Project 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></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure</td><td>Assessment of the theoretical component is conducted in Greek and consists of:
• a mid-term written examination, accounting for 30% of the final grade;
• a final written examination, accounting for 70% of the final grade.
The examinations include a combination of:
• multiple-choice questions;
• short-answer questions;
• true/false questions;
• matching questions.</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

Greek-Language Textbooks

- Pepper, I., Gerba, C., & Gentry, T. (2025). *Environmental Microbiology*. A. Papazisis Publications.
- Kirchman, D. L. (2021). *Microbial Ecology*. University of Crete Press, Foundation for Research and Technology – Hellas.
- 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.

Supplementary Literature

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

FIELD CROP PRODUCTION II (INDUSTRIAL AND ENERGY CROPS)

COURSE OUTLINE

Responsible: Konstantinos Paschalidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.7.017.0	**SEMESTER**	2nd
COURSE TITLE	Field Crop Production II (Industrial and Energy Crops)		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	3
	2	2
Total	**2**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialisation / Elective Course
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://iro.hmu.gr/agriculture-english-courses/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

Learning Outcomes

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

- identify the major industrial and energy crops and understand their morphology and physiology;
- understand and propose solutions to problems related to crop management practices and evaluate the effects of biotic and abiotic factors on crop productivity;
- recognize the main products and by-products of industrial and energy crops and understand their agricultural and economic importance.

General Competences

General Competences

- Search for, analyze and synthesize data and information using appropriate technologies.
- Decision-making.
- Independent work.
- Teamwork.

3. SYLLABUS

COURSE CONTENT

Theory

For each crop, the following topics are covered:

- geographical distribution and economic importance;
- botanical characteristics and developmental stages, together with the factors affecting growth;
- classification, cultivated varieties and hybrids;
- cultivation practices (crop rotation, soil preparation, fertilization, sowing, irrigation and harvesting);
- pests and diseases;
- quality characteristics of products and their utilization.

Special emphasis is given to **seed production** of cotton, tobacco and sugar beet.

Laboratory

The laboratory focuses on the principal industrial and energy crops:

- Cotton
- Flax
- Hemp
- Tobacco
- Sugar beet
- Sunflower
- Rapeseed
- Sesame
- Safflower
- Castor bean

For each crop, students study:

- classification and varieties;
- cultivation practices;
- pests and diseases;
- products and by-products.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Teaching Method: Face-to-face teaching through lectures in the lecture hall and practical sessions in the laboratory.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td><h2>Use of Information and Communication Technologies</h2>• PowerPoint presentations and audiovisual material.
• Learning support through the e-Class platform.
• Communication with students via e-Class and e-mail.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>26</td></tr><tr><td>Practical/Laboratory Exercises</td><td>26</td></tr><tr><td>Field Study</td><td>13</td></tr><tr><td>Coursework Preparation</td><td>20</td></tr><tr><td>Independent Study</td><td>40</td></tr><tr><td>Course total</td><td>125</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure</td><td>Assessment includes:
Theory
• Final written examination.
Laboratory
• Group laboratory exercises (groups of 2–4 students), assessed through laboratory reports (approximately 33% of the laboratory grade).
• Individual final laboratory examination (approximately 67% of the laboratory grade).
Four laboratory exercises are directly related to the field exercise component.</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

- Galanopoulou, S. (2002). *Industrial Crops*. Stamoulis Publications.
- Papakosta, D. (2013). *Industrial Crops* (2nd Edition). Synchroni Paideia Publications.
- Bilalis, D., Papastylianou, P.-T., & Travlos, I. S. (2018). *Field Crops*. Pedio Publications.
- Toli, I. D. (1992). *Cotton Cultivation and Plant Protection in Greece*. Triantafyllis Publications.

SOILLESS CULTIVATIONS

COURSE OUTLINE

Responsible: Dimitrios Papadimitriou

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.7.018.0	**SEMESTER**	1st
COURSE TITLE	Soilless cultivations		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	5
Total	**0**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The module aims to provide students with both the theoretical background and practical skills required for the design, establishment, and management of modern soilless cultivation systems, with particular emphasis on hydroponic production. It covers the principles of hydroponic system design, growing substrate selection, nutrient solution formulation and management, and the application of sustainable production practices. The module is designed to equip students with the knowledge and technical competencies required to establish and efficiently operate commercial hydroponic production systems, particularly for vegetable crops.

Students will be able to:

- design hydroponic cultivation systems appropriate for different crops and production conditions;
- select suitable growing substrates and the necessary equipment for hydroponic installations;
- estimate the materials, equipment requirements, and associated costs for the establishment and operation of hydroponic production systems;
- formulate, prepare, and adjust nutrient solutions according to crop nutritional requirements and environmental conditions;
- diagnose and address problems related to plant nutrition and the operation of hydroponic systems; and
- provide scientifically sound technical guidance to growers and other stakeholders on the design, establishment, and management of soilless cultivation systems.

General Competences

- Ability to search for, analyse, and synthesize scientific data and information using modern information and communication technologies.
- Application of theoretical knowledge to the design and management of hydroponic production systems.
- Evidence-based decision-making regarding the selection of growing substrates, nutrient solutions, and cultivation systems.
- Ability to work independently and collaboratively in multidisciplinary teams.
- Design and evaluation of alternative technical solutions for sustainable crop production systems.
- Development of research ideas in the field of soilless cultivation.
- Promotion of critical, creative, and inductive thinking.

3. SYLLABUS

The theoretical component is delivered through lectures supported by multimedia teaching materials. Laboratory sessions include demonstrations and hands-on training in the installation, operation, and management of different hydroponic systems, followed by the establishment and cultivation of vegetable crops using these systems to reinforce theoretical knowledge through practical application.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of multimedia presentations and audiovisual teaching materials during lectures. Utilization of the University's Learning Management System (LMS) for the dissemination of course materials, assignments, announcements, and communication with students. Application of specialized software and digital tools for the design and management of hydroponic systems, nutrient solution formulation and evaluation, and the analysis and processing of experimental data.
TEACHING METHODS The manner and methods of teaching are described in detail.	**Activity** | **Semester workload** **Course total** |
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Assessment of the theoretical component is based on a written final examination. The laboratory component is assessed through a combined written and practical examination, designed to evaluate both students' theoretical understanding and their ability to apply the techniques and methods acquired during the laboratory sessions.

5. ATTACHED BIBLIOGRAPHY

1. Σάββας, Δ. *Καλλιέργειες Εκτός Εδάφους*. Εκδόσεις Σταμούλη, Αθήνα.
2. Sonneveld, C., & Voogt, W. (2009). *Plant Nutrition of Greenhouse Crops*. Springer.
3. Raviv, M., Lieth, J. H., & Bar-Tal, A. (Eds.). (2019). *Soilless Culture: Theory and Practice* (2nd ed.). Elsevier.

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.	

Activity	Semester workload
Lectures	39
Practical Exercises	13
Coursework Preparation	13
Independent Study	60
Course total	**125**

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.

GEOLOGY - GEOPHYSICS

COURSE OUTLINE

Responsible: Eleni Kokkinou

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.7.024.0	**SEMESTER**	1st
COURSE TITLE	Geology - Geophysics		

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	Specialisation Course / Track B
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/AGRO297/

2. LEARNING OUTCOMES

Learning outcomes

The course provides the fundamental knowledge required for a wide range of courses offered within the **Natural Resources Management** specialization of the Department of Agriculture. The study and analysis of geological processes responsible for shaping the Earth's surface, soil formation and subsurface structure contribute to the sustainable management of natural resources and the environment.

The course introduces students to the basic concepts of geology and geophysics in agricultural environments and familiarises them with the principal tools used in projects and studies related to these disciplines. In addition, students become acquainted with techniques for determining soil parameters useful for monitoring soil health.

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

- understand the fundamental principles of geology and geophysics;
- describe, classify and interpret landforms;
- meet the basic requirements for fieldwork;
- develop orientation skills and interpret topographic and geological maps;
- identify geological formations, with emphasis on soil-forming geological materials;
- calculate and evaluate geophysical parameters relevant to agricultural soils.

General Competences

- Search for, analyse and synthesise data and information using appropriate technologies to support effective decision-making.
- Work independently and collaboratively, preparing students to operate successfully in an international and interdisciplinary working environment and contribute to the generation of new knowledge.
- Respect the natural environment through accurate planning and optimal management of agricultural projects.
- Exercise critical thinking and self-assessment in order to promote constructive collaboration and independent scientific reasoning.

3. SYLLABUS

Introduction to Earth Structure

- Earth materials.
- Minerals and rocks.
- Igneous rocks.
- Sedimentary rocks.
- Metamorphic rocks.
- Geological time.
- Fossils.
- Paleoclimatology.
- Stratigraphy.

Terrestrial Environment

- Structure of terrestrial environments.
- Weathering and erosion.
- Soils and rocks.
- Geological mapping.

Topographic and Geological Maps

- Principles and branches of cartography.
- Map scales.
- Map projections.
- Map design and interpretation.

Field Orientation

- Horizon.
- Types of horizons.
- Visibility.
- Basic field orientation techniques.

Landforms

- Classification and characteristics of geomorphological features.
- Landscape evolution and controlling factors.

Geophysics

- Fundamental principles of geophysical methods applied to agriculture.
- Electrical, electromagnetic and magnetic methods.

Applied Geoelectromagnetics

- Electrical, dielectric and magnetic properties of rocks and minerals.
- Propagation and attenuation of electromagnetic fields.
- Direct current electrical methods (survey configurations, data processing and interpretation).
- Induced Polarisation (IP): principles, measurements, interpretation, examples and applications.

Electromagnetic Mapping

- Data acquisition.
- Processing and interpretation.
- Applications to environmental, agricultural and hydrogeological investigations.

Ground Penetrating Radar (GPR)

- Basic theory.
- Data acquisition.
- Processing and interpretation.
- Applications to environmental and soil investigations.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	The course is delivered through face-to-face lectures in the lecture hall and demonstrations of field techniques at the University Experimental Farm.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• PowerPoint presentations and other audiovisual teaching materials. • Learning support through the HMU e-Class platform. • Communication with students via the e-Class platform and e-mail.
TEACHING METHODS The manner and methods of teaching are described in detail.	**Activity** / **Semester workload** Activity Semester Workload (hours) Lectures 52 Field Exercises 16 Coursework Preparation 13 Independent Study 44 — 125 **Course total** — **125**
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Assessment consists of: • a final written examination; • two optional mid-term tests, the combined grade of which contributes **30%** to the final course grade. The examinations include: • essay-type questions; • multiple-choice questions; • true/false questions; • matching questions.

5. ATTACHED BIBLIOGRAPHY

- Rontogianni-Tsiabaou, T. (2018). *Geology*. Tziola Publications.
- Stournaras, G. K., & Stavropoulou, M. H. (2016). *Engineering Geology*. Tziola Publications.
- Kokkinou, E. (2015). *Environmental Geology and Geotechnology*. Hellenic Academic Libraries Link.
- Tzanis, A. (2020). *Elements of General and Applied Geophysics*. Neon Publications.

RENEWABLE ENERGY IN AGRICULTURE

COURSE OUTLINE

Responsible: Angeliki Maragkaki

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.8.004.0	**SEMESTER**	2nd
COURSE TITLE	Renewable Energy in Agriculture		

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

COURSE TYPE general background, special background, specialised general knowledge, skills development	
PREREQUISITE COURSES	Agricultural Waste Management
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

This course provides students with fundamental knowledge of energy resources, with a particular emphasis on renewable energy sources. It focuses on geothermal energy and biomass technologies, combining theoretical instruction with practical training through laboratory sessions and hands-on exercises.

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

- Develop a comprehensive understanding of the global and national energy landscape.
- Evaluate and design geothermal energy systems for agricultural applications.
- Assess the environmental impacts associated with geothermal energy exploitation and make informed decisions based on technical, economic, and environmental considerations.
- Understand the properties of biomass and its energy production potential from land-related biomass resources, particularly agricultural residues.
- Identify agricultural residues suitable for combustion and the production of thermal and electrical energy.
- Identify agricultural residues suitable for biogas production through anaerobic digestion.
- Evaluate the performance of anaerobic digestion processes using key operational parameters, such as biogas composition, pH, volatile fatty acids (VFAs), and other monitoring indicators.
- Calculate the heating requirements of agricultural facilities using biomass-based energy systems.
- Design, size, organize, and operate anaerobic digestion plants treating one or more agricultural residues.
- Understand the principles and processes of geothermal energy utilization and biomass conversion

technologies (combustion and anaerobic digestion), as well as their relationship with agricultural land, agricultural residues, and their sustainable utilization.
- Develop the ability to work both independently and collaboratively, preparing them for interdisciplinary and international professional environments while fostering the creation of new knowledge.
- Demonstrate respect for the natural environment through the design of energy production systems with minimal environmental impact.
- Make informed decisions regarding the optimal use of geothermal energy and available biomass resources for sustainable energy production.

General Competences

- Searching for, analyzing, and synthesizing data and information using appropriate technologies
- Decision-making
- Independent work
- Teamwork

3. SYLLABUS

The course is divided into two main parts.

Part I: Geothermal Energy

1. The current energy landscape and the future of energy; the energy situation in the European Union; future energy perspectives; and the Greek energy system.
2. Agriculture as an energy producer: energy inputs and outputs in agricultural systems.
3. Natural gas and renewable energy sources in agriculture.
4. Geothermal energy: formation of geothermal fields, geothermal gradients, and classification of geothermal resources.
5. Geothermal energy worldwide and the geothermal resources of Greece.
6. Agricultural applications of geothermal energy, including greenhouse and soil heating, aquaculture, and geothermal heat pumps.
7. Environmental impacts associated with geothermal energy exploitation.
8. Site selection criteria for geothermal energy production facilities.
9. Advantages and limitations of geothermal energy utilization.

Part II: Biomass Energy

10. Biomass and Biomass Potential: Introduction to biomass as a renewable energy resource, with emphasis on the energy potential of agricultural residues and other biomass feedstocks.

11. Biomass Conversion Processes: Overview of biomass conversion technologies, focusing on thermochemical conversion (combustion) and biological conversion through anaerobic digestion for biogas production.

12. Biomass Combustion: Principles of biomass combustion, including the stages of the combustion process, the influence of biomass characteristics (moisture content, ash content, and particle size), and biomass combustion systems.

13. Anaerobic Digestion and Influencing Factors: Fundamentals of the anaerobic digestion of agricultural residues, including the microbiology of the process, key operational parameters (temperature, pH, alkalinity, nutrients, and inhibitory compounds), and current technological applications.

14. Design and Sizing of Biomass Energy Systems: Theoretical concepts supported by practical examples and engineering exercises on the design and sizing of biomass energy conversion systems, with particular emphasis on anaerobic digestion facilities.

15. Heating Demand Calculations for Agricultural Facilities: Application of engineering principles and problem-solving exercises for calculating the heating requirements of agricultural facilities, such as greenhouses, using biomass-based energy systems.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	The course is delivered through face-to-face instruction, including 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 and other audiovisual materials are used to support lectures. • The learning process is supported through the University's e-Class learning management system. • Communication with students is carried out via e-mail through the e-Class platform
TEACHING METHODS The manner and methods of teaching are described in detail.	**Activity** | **Semester workload** **Course total** |
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	Student assessment consists of a final written examination and two optional short mid-term tests (quizzes), the combined score of which contributes 30% to the final course grade. The written examinations include a combination of essay questions, multiple-choice questions, true/false questions, and matching exercises. The laboratory component is assessed separately. The laboratory grade is based on the student's performance in the compulsory written laboratory examination (60%) and on laboratory reports and presentations of experimental results (40%).

5. ATTACHED BIBLIOGRAPHY

- Bioenergy Production by Anaerobic Digestion, Korres N., O' Kiely P., Benzie J. Taylor & Francis ltd, ISBN 0415698405
- Biogas from Waste and Renewable Resources, Dieter Deublein, Angelika Steinhauser, Wiley-VCH Verlag GmbH, ISBN 352732798

APICULTURE

COURSE OUTLINE

Responsible: Eleftherios Alyssandrakis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0810.9.001.0	**SEMESTER**	2nd
COURSE TITLE	Apiculture		

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	Specialised Background Course
PREREQUISITE COURSES	Novε
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/GF110/

2. LEARNING OUTCOMES

Learning outcomes

The course introduces students to the fundamental principles of apiculture through the study of honey bee biology, behaviour and colony organisation. It focuses on beekeeping products, their nutritional value and applications, beekeeping management practices, and annual colony management planning. The overall objective is to provide students with comprehensive knowledge covering the entire field of apiculture.

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

- understand the taxonomy and races of honey bees;
- describe the biological cycle and social organisation of honey bee colonies;
- understand honey bee behaviour and activities;
- identify the major nectar flows and bee forage resources;
- apply essential beekeeping management practices and understand the production of bee products;
- recognise the major pests and diseases affecting honey bees;
- understand the principles of honey bee genetics, breeding and queen rearing;
- develop annual management plans for honey bee colonies.

General Competences

- Search for, analyse and synthesise data and information using appropriate technologies.
- Decision-making.

- Independent work.
- Teamwork.
- Generation of new research ideas.
- Respect for the natural environment.
- Promotion of free, creative and inductive thinking.

3. SYLLABUS

Theoretical Syllabus

- Taxonomy and races of honey bees.
- Biological cycle and social organisation of honey bee colonies.
- Honey bee behaviour and activities.
- Major nectar flows and bee forage resources.
- Beekeeping management practices.
- Bee products.
- Honey bee pests and diseases.
- Honey bee genetics, breeding and queen rearing.
- Annual planning of beekeeping management.

Laboratory Syllabus

- Honey bee morphology and anatomy.
- Bee forage plants.
- Beekeeping equipment.
- Honey crystallisation.
- Identification of bee pests and diseases.
- Honey sensory evaluation (honey tasting).
- Introduction to other bee products.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face lectures in the lecture hall and laboratory practical sessions.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	• PowerPoint presentations and audiovisual material, including videos. • Learning support and communication with students through the HMU e-Class platform.
TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	**Semester workload**
Lectures	24
Laboratory Exercises	16
Coursework	45
Independent Study	40
Course total	**125**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	**Theory** Students are assessed at the end of the semester through a written examination consisting of: • short-answer questions; • multiple-choice questions. **Laboratory** The laboratory grade is based on: • written examination with short-answer and multiple-choice questions; • identification of laboratory specimens and materials presented during practical sessions. • project

5. ATTACHED BIBLIOGRAPHY

- Sammataro D. and Avitable A. (2021). *The Beekeeper's Handbook*, CORNELL UNIVERSITY PRESS
- Flottum K. (2024). *The Backyard Beekeeper – Fifth Edition: An Absolute Beginner's Guide to Keeping Bees in Your Yard and Garden*, Quarto Publishing Group USA Inc
- Journals: Apidologie, Bee World, Journal of Apicultural Research, The American Bee Journal

INTRODUCTION TO AGRICULTURAL SCIENCES

COURSE OUTLINE

Responsible: Konstantinos Paschalidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΓΠ2002	**SEMESTER**	2nd
COURSE TITLE	Introduction to Agricultural Sciences		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	3
	1	1
Total	**4**	**4**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised Background Course
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Spring Semester
COURSE WEBSITE (URL)	https://iro.hmu.gr/agriculture-english-courses/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

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

- understand the fundamental principles of agricultural science and the cultivation of field crops for the production of products useful to humans and animals;
- identify the seeds of the most important field crops and understand basic aspects of their anatomy, morphology and physiology;
- understand the main types of farming systems, as well as the climatic, soil-related and biotic factors affecting crop growth and yield.

General Competences

Generic Competences

- Search for, analyse and synthesise data and information using appropriate technologies.
- Decision-making.

- Independent work and teamwork.
- Generation of new research ideas.
- Promotion of free, creative and inductive thinking.

3. SYLLABUS

COURSE CONTENT

Theoretical Syllabus

- Fundamental principles and historical development of agriculture.
- Major crops cultivated in Greece and worldwide.
- Agricultural resources of Greece and their contribution to the national economy.
- Categories of field crops and basic aspects of their anatomy, morphology and physiology.
- Climatic factors, including temperature, solar radiation, winds, frost and precipitation, and their effects on crops.
- Soil factors, including soil texture, structure, organic matter, microorganisms, soil reaction and related properties.
- Plant reproduction and the fundamental principles of weed management.
- Plant nutrition and fertilisation.
- Seed quality and soil tillage systems.
- Sowing methods, cropping systems, harvesting and storage of field-crop products.

Practical Exercises

- Classification of field crops.
- Seed dormancy, germination and emergence.
- Morphology of field crops.
- Varietal and commercial purity of seeds.
- Identification of field-crop seeds and use of seed collections.
- Determination of seed moisture content, specific weight and thousand-kernel weight.
- Field-crop weeds: morphology, biology and classification.
- Weed identification using weed collections.
- Seed germination capacity and fundamental principles of weed management.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Teaching Method: Face-to-face teaching 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	**Use of Information and Communication Technologies (ICT)** • PowerPoint presentations and audiovisual teaching material. • Learning support through the HMU e-Class platform. • Communication with students via the e-Class platform and e-mail.

TEACHING METHODS The manner and methods of teaching are described in detail.	

Activity	Semester workload
Lectures	39
Practical/Laboratory Exercises	13
Independent Study	48
Course total	**100**

STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	**Theory** Assessment consists of a final examination accounting for **100%** of the theoretical component. Students may be required to answer: • true/false questions; • matching questions; • essay-type questions; • multiple-choice questions; • questions requiring the completion of terms in diagrams; • one-word or short-answer questions. An optional coursework assignment may also be undertaken. **Practical Exercises** Assessment of the practical component is integrated into the theoretical assessment and includes written and/or oral examination through: • practical exercises; • critical-thinking questions; • application-based questions.

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

- Dordas, C. (2018). *General Agriculture*. Christina and Vasiliki Kordali Publications. ISBN: 978-960-357-127-8. Eudoxus Book Code: 77107574.
- Bilalis, D., Papastylianou, P.-T., & Travlos, E. S. (2018). *Agriculture*. Pedio Publications. ISBN: 978-960-546-039-6. Eudoxus Book Code: 77118175.
- Karamanos, A. I. (2011). *General Agriculture*. Papazisis Publications. ISBN: 978-960-02-2623-2. Eudoxus Book Code: 68387961.
- Christakos, K. (2004). *General Agriculture: Laboratory Notes*. TEI of Crete, Heraklion.
- Papakosta-Tasopoulou, D., & Koutroubas, S. (2025). *Special Crop Production: Cereals and Legumes*. Christina and Vasiliki Kordali Publications. ISBN: 978-960-357-151-3. Eudoxus Book Code: 143554774.
- Papakosta-Tasopoulou, D. (2013). *Industrial Crops*. Christina and Vasiliki Kordali Publications. ISBN: 978-960-357-112-4. Eudoxus Book Code: 32998760.
- Dordas, C. (2024). *Aromatic and Medicinal Plants*. Christina and Vasiliki Kordali Publications. ISBN: 978-960-357-147-6. Eudoxus Book Code: 133043861.
- Ibrahim-Avraam, Ch. A. (2024). *Elements of Crop Cultivation and Seed Production*. University of Thessaly Property Management and Development Company. ISBN: 978-960-9439-92-3. Eudoxus Book Code: 133039103.
- Trantas, E. (2024). *Plant Breeding Laboratory Manual*. Kallipos Open Academic Editions. ISBN: 978-618-228-093-5. Eudoxus Book Code: 122339306.
- Tokatlidis, I. (2023). *Plant Breeding*. Kallipos Open Academic Editions. ISBN: 978-618-228-024-9. Eudoxus Book Code: 122074390.
- Travlos, I., & Kanatas, P. (2021). *Weed Science and Agriculture*. Pedio Publications. ISBN: 978-960-635-383-3.

Eudoxus Book Code: 102124829.
- Vasilakoglou, I., & Dimas, K. (2021). *Modern Weed Science*. Christina and Vasiliki Kordali Publications. ISBN: 978-960-357-140-7. Eudoxus Book Code: 102076112.
- Rao, P. L., Thirupathi, I., & Sadvi, P. (2018). *Glimpse on General Agriculture: For ICAR-JRF, SRF, NET and ASRB Prelims*. ISBN: 978-9386652454.
- Sheaffer, C., & Moncada, K. (2011). *Introduction to Agronomy: Food, Crops, and Environment*. Delmar Cengage Learning.
- Sparks, D. L. (2026). *Advances in Agronomy*. Elsevier. ISBN: 978-0-443-43268-2.

PLANT BREEDING

COURSE OUTLINE

Responsible: Konstantinos Paschalidis

1. GENERAL			
SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Department of Agriculture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΓΠ5004	**SEMESTER**	1st
COURSE TITLE	Plant Breeding		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	3	3
	2	2
Total	**5**	**5**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised Background Course
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English) — Winter Semester
COURSE WEBSITE (URL)	https://iro.hmu.gr/agriculture-english-courses/

2. LEARNING OUTCOMES

Learning outcomes

LEARNING OUTCOMES

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

- describe the fundamental principles and methods of conventional plant breeding;
- identify the sources and forms of genetic variation used in the development of new cultivars;
- design and justify a simple breeding programme for major crop species;
- select appropriate selection and crossing methods, taking into account crop objectives, environmental conditions and market requirements;
- evaluate phenotypic data obtained from plant breeding experiments;
- use basic statistical and genetic tools in the analysis of breeding data;
- critically assess the advantages and limitations of different plant breeding strategies.

General Competences

Generic Competences

- Search for, analyse and synthesise data and information using appropriate technologies.
- Decision-making.
- Generation of new research ideas.
- Promotion of free, creative and inductive thinking.

3. SYLLABUS

COURSE CONTENT

Theoretical Syllabus

Introduction to Plant Breeding

Plant breeding is presented as an applied science which, through the manipulation of genetic material, aims to develop new cultivars in order to increase productivity and improve living standards.

Plant Reproduction

The two main modes of plant reproduction, vegetative and sexual reproduction, are examined. Particular emphasis is placed on meiosis and fertilisation as the principal mechanisms generating heritable genetic variation used in plant breeding.

Scope of Plant Breeding

The subject matter of plant breeding is defined through the development of single-genotype and multi-genotype cultivars. The objectives and stages of a breeding programme for the improvement of quantitative agronomic traits are analysed.

Quantitative Traits

Quantitative traits are examined with emphasis on their complex inheritance and the strong influence of the environment, highlighting the need for the use of statistical tools.

Genetic Variation

The course focuses on genetic variation, whether naturally occurring or artificially induced, as the basis of plant breeding. The mechanisms generating variation, its use as starting material, and the technique of controlled pollination are analysed.

Factors Affecting Selection

The critical environmental and genetic factors affecting the objective evaluation of quantitative traits are examined, including spatial heterogeneity and competition. Their contribution to the yield gap is analysed, with emphasis on reducing their adverse effects.

Competition in Crop Production

The effects of competition and cultivar dependence on plant density are analysed. These factors can cause

inequality and yield losses within a crop. The productive ideotype is presented as essential for narrowing the yield gap.

Competition in Plant Breeding

The course explains why genotype selection should be conducted under non-competitive conditions. In contrast to intergenotypic competition, the absence of competition maximises phenotypic differentiation, improves heritability and permits high selection intensity.

Experimental Designs in Plant Breeding

Models of agricultural experimentation and methods for controlling spatial heterogeneity are described. Particular emphasis is placed on honeycomb designs, which are systematically used for genotype evaluation under non-competitive conditions.

Mass Selection

Mass selection is presented as the simplest method for improving plant populations.

Pedigree Selection

Pedigree selection is examined as the main method for developing pure lines through successive self-pollination and progeny testing. Its effectiveness is enhanced when applied under non-competitive conditions, thereby maximising heritability and genetic gain.

Hybrid Development

The stages of hybrid development are described, including reselection, development of parental lines and evaluation. Combining ability and heterosis are used as key criteria, while the distinction between heterotic and homozygous superiority is analysed.

Backcrossing

Backcrossing is presented as a specialised breeding method involving successive crosses with the recurrent parent. It is used to transfer one or a few desirable monogenic traits while simultaneously recovering the genetic background of an elite cultivar.

Laboratory Exercises

- Introduction to plant breeding.
- Qualitative and quantitative traits.
- Heredity exercises.
- Flower structure and sex expression.
- Selection of plants for disease resistance.
- Artificial pollination.
- Mutagenesis.
- Male sterility.
- Molecular markers.
- Pedigree selection.
- Seed production and certification.

- Statistical analysis of experimental results.

4. TEACHING and LEARNING METHODS - EVALUATION	
DELIVERY Face-to-face, Distance learning, etc.	Teaching Method: Face-to-face teaching 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	**Use of Information and Communication Technologies (ICT)** • PowerPoint presentations and other audiovisual teaching materials. • Learning support through the HMU e-Class platform. • Communication with students via the e-Class platform and e-mail.
TEACHING METHODS The manner and methods of teaching are described in detail.	**Activity** / **Semester workload** Lectures: 39 Practical/Laboratory Exercises: 26 Independent Study: 60 **Course total**: **125**
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	**Theoretical Component** Assessment includes: • interim multiple-choice tests administered at the end of each chapter; • a final multiple-choice examination. The final examination consists of **40 multiple-choice questions**, each with one correct answer. The number of correct answers obtained in the interim tests is added to the total number of correct answers in the final examination. Therefore, regular attendance and participation contribute positively to the final result. **Laboratory Component** Assessment consists of a final examination containing **36 multiple-choice questions**, each with one correct answer.

5. ATTACHED BIBLIOGRAPHY

RECOMMENDED LITERATURE

- Tokatlidis, I. *Plant Breeding: Principles and Methods*. Kallipos Open Academic Editions. Eudoxus Book Code: 122074390.
- Fanourakis, N. (1999). *Plant Breeding: Basic Principles*. Ion Publications.
- Available bibliography from the course of Genetics

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