COURSE OUTLINE

1. GENERAL

SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Agriculture		
LEVEL OF STUDIES	Undergraduate		
	AGRI EX3	**SEMESTER**	7th or 9th
COURSE TITLE	Composting & Soil Organic Matter		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	
Tutorials	0	
Laboratory	2	
TOTAL	**4**	**5**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General knowledge (Composting)
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The study of soil organic matter aims to provide understanding of the structure, properties and transformations of the colloidal soil system, from the macroscopic to the molecular level and the creation of organic fertilizers through composting processes imitating the degradation functions of organic matter in nature. Therefore, soil organic matter is the basic substrate on which both nutrients and microbial communities are found in soil. Combining information of botany, microbiology, physics and chemistry, the study of soil organic matter leads to the awareness of biogeochemical cycles and therefore can contribute to the restoration of pathogenic soils and the sustainable management of agro-ecosystems through the utilization and conversion of organic matter in organic conditioners fertilizers (humic and fulvic acids).

Upon the successful completion of this course the students will have the knowledge and skills

to:

1. Know the physicochemical properties of soil organic matter.
2. Know the methods of measuring and analyzing these properties.
3. Evaluate the organic matter suitability depending on the type of soil and cultivation.
4. Recommend / use the appropriate form of soil conditioners in order to maintain and increase the fertility of agro-ecosystems.
5. Use organic matter as a biostimulator

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*…..…*
Production of new research ideas	*Others…*
	…..…

The course will provide fundamental principles of physics, chemistry and biochemistry with an emphasis on developing a skill base necessary for the analysis and interpretation of experimental data, derived from the use of analytical and spectroscopic techniques.

At the end of this course the student will have further developed the following skills (general skills):

- Ability to identify and name the active building blocks of soil organic matterAbility to process experimental measurements and render the results in the correct format
- Ability to process experimental measurements and render the results in the correct format
- Ability to find information from any book of soil organic matter as well as from internet sources

In general, upon completion of this course the student will have further developed the following general skills (from the list above):

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Respect for the natural environment
Criticism and self-criticism

3. SYLLABUS

The course will include the following sections of study:
Introduction to soil organic matter (2 lectures):
• The importance of organic matter in the soil-plant system
• Humification
• Sources of organic matter
Humus fractions (2 lectures):
• Humic Acids - soil fertility
• Fulvic Acids - pollutants transportation

• Humin – Carbon sequestration and GHG retention in soil
Soil organic matter analysis (2 lectures):
• Analytical Techniques
• Spectroscopic Techniques
• Chromatographic Techniques
• Molecular Techniques
The Molecular Nature and Properties of Soil Organic Matter (2 Lectures):
• The physicochemical colloidal properties of humus
• The biochemical properties of humus
• The biogeochemical system of the rhizosphere
Methods and techniques of soil organic matter production- Compost (2 Lectures):
• With natural mechanisms-composting
• With molecular chemical activators
• Biochemically via enzyme catalysis
Utilization of composted soil organic matter: The natural fractions - humic and fulvic acids (2 Lectures):
• Improving the fertility of problematic soils
• Consolidation and restoration of agricultural systems
• Plant growth biostimulation
Environmental ecotoxicity of organic soil conditioners (Biochar, compost, etc.) **(1 Lecture)**

Laboratory exercises
1. Methods and techniques of soil organic matter production. Composting process and techniques-Types of composting: aerobic/anaerobic composting procese and worm composting.
2. Organic waste composting machines-types and operation
3. Sampling from a Compost Pile, Measuring Oxygen Concentration and Temperature, Determining Moisture Content
4 Determining Organic Matter, Volatile Solids, Ash Content
5. Determining Bulk Density and Air-Filled Pore Space
6. Measuring Static Pressure and Determining Fan Airflow
7. Calculating Optimal Mixing Ratios
8. pH and Soluble Salts.
9. Toxicity evaluation of compost. Sustainable sanitation techniques
10. Evaluatinon of compost on the composition of soil microbial communities. Phospholipid fatty acid analysis (PLFA analysis)
11. Extraction, Isolation, and Identification of Bioactive Compounds: Humic and Fulvic substances from Compost
12. Humification of compost for agricurture use and encapsulation of nutrient (Bio-fertilizers)
13. Compost Bioassay

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures in the classroom, laboratory and field.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of ICT (power point) in Teaching • Use of ICT in Communication with students (Learning process support through the electronic platform e-class).
TEACHING METHODS *The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as*	

Activity	***Semester workload***
Lectures	26
Laboratory	26
Writing short reports of laboratory exercises	13
Final Exams	3
Study hours and preparation for the laboratory exercises and the final examination	57

the hours of non directed study according to the principles of the ECTS	Course total	**125**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple* *choice questionnaires, short-answer questions,* *open-ended questions, problem solving, written* *work, essay/report, oral examination, public* *presentation, laboratory work, clinical examination of patient, art interpretation,* *other* *Specifically-defined evaluation criteria are* *given, and if and where they are accessible to* *students.* 1	1. The laboratories participate by 30% in the final grade. In order to be examined in theory, the student must have completed all the laboratories and have been successfully examined in them. 2. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with other knowledge. Particular emphasis is placed on whether they have developed the ability to apply this knowledge to crop selection and to assess the impact of these changes on the environment. Emphasis is also placed on demonstrating critical ability and justifying the choices they make in each problem. 3. Evaluation is dynamic. It mainly involves problem solving. is done orally or in writing or with a combination of the two, with or without pre-examination on the basic principles of the course, with or without exculpatory advances and with other test or inventive methods, depending on the composition of the dynamics and the needs of the audience. 4. The above are done in the Greek language. For foreign language students (eg Erasmus students) conducted in English	

5. RECOMMENDED LITERATURE

-Προτεινόμενη Βιβλιογραφία :

- Βιβλίο [22947]: Οργανική ουσία του εδάφους, Κουκουλάκης Πρόδρομος Χ., Σιμώνης Ασ. Δ., Γκέρτσης Αθ. Κ. Λεπτομέρειες
- Βιβλίο [86200460]: ΕΔΑΦΟΛΟΓΙΑ, N. C. Brady, R. R. Weil Λεπτομέρειες

-Συναφείς επιστημονικές πηγές και περιοδικά:

- F.J. Stevenson, 1994. Humus Chemistry: Genesis, Composition, Reactions, 2nd Edition, Wiley, ISBN: 978-0-471-59474-1
- A. Piccolo, 1996. Humic Substances in Terrestrial Ecosystems, Elsevier, ISBN: 9780080534237
- Silvio Vaz Jr., 2019. Sustainable Agrochemistry, A compendium of Technologies, Springer, ISBN: 978-3-030-17890-1.
- https://journals.lww.com/soilsci/Abstract/2001/11000/THE_SUPRAMOLECULAR_STRUCTURE_OF_HUMIC_SUBSTANCES.7.aspx

https://en.wikipedia.org/wiki/Humic_substance