FACULTY/SCHOOL	FACULTY OF ENVIRONMENT		
DEPARTMENT	FOOD SCIENCE AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURCE UNIT CODE	**FST801**	**SEMESTER**	**8**
COURCE TITLE	**SOIL MANAGEMENT AND FOOD QUALITY**		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS (ECTS)**
Lectures	2	
Tutoring	---	
Laboratory	2	
Total	**4**	**5**
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise Skills Development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek/English
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (English/Greek)
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

The course exposes the students to the concept of natural resources, the contemporary problems related to their management, and challenges faced by the food production and quality sector. In particular, the course analyzes the value of soil as a medium of food production and how to best manage it for the production of plentiful, quality products. Special attention is paid to the role of soil in shaping *terroir* and supporting quality schemes (Protected Designation of Origin and Protected Geographical Indication) for wine, olive oil, pulses, cheeses, etc.

Specifically, the course reviews introductory concepts required to understand soils; in the laboratory part, it reviews methods of soil management aiming to preserve fertility, so that each student has a broad understanding of processes and methods for the exploitation of soils and the production of plentiful, quality food.

Additionally, the course aims at exposing students to contemporary issues and threats related to natural resources and their interrelationships, encompassing a broad domain of supplementary knowledge to aid their comprehension; overpopulation, food demand, availability of natural resources and arable lands, support for food production systems, climate change, etc.

Therefore, the objective of this course to provide students with the knowledge required to study the soil as a natural resource of overarching importance for food production and quality. It examines the basic soil properties in order to: (a) train students how to evaluate the state and availability of soil resources in the context of increasing demand for production of plentiful, quality food, (b) comprehend the significance of soils for food production systems and food quality in the modern economy, and (c) enhance prospects for a distinguished professional occupation in the discipline.

After completing this course, students must be able to:

- Comprehend the basic soil properties and their significance for food production systems and food quality
- Know the tools and techniques for sustainable soil management for food production
- Apply laboratory methods to assess soil fertility and interpret analyses of soils and plant tissues aiming to evaluate the capacity of soils to produce quality food
- Redact and present opinions on the use and management of soils for the production of food crops, thus developing skills of written and oral communication of project results

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

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

1. Working autonomously
2. Teamwork
3. Interdisciplinary work
4. Decision making
5. Respect for the natural environment
6. Promoting free, creative, and deductive reasoning

COURSE CONTENT

THEORY

1. Introduction; soil as natural resource; soil functions; soil genesis; soil classification; present and future demands for plant nutrition and crop production in developed countries.
2. Sustainable soil management and food production and quality: farming systems; soil management and securing the production of plentiful, quality food.
3. Crop production and food availability; food security for an ever-growing global population; prospects for food production in developing countries; demands placed on the agricultural sector for food security; nutrients in production and consumptions cycles; problems and opportunities.
4. Soil physical properties. Structure; compression, mechanisms, consequences, preventive and corrective measures; soil water; soil atmosphere; wetland soils; natural and constructed wetlands.
5. Soil chemical properties. Soil pH; carbonates; soil colloids; cation exchange phenomena and their importance in soil management for securing fertility and food production.
6. Soil biological properties. Organic matter; global C cycle and climate change; biotechnological approach in soil management and food production; soil organisms and their ecology; influence of microorganisms on soil functions and sustainable soil management.
7. Soil fertility and crop productivity; the soil as the basis of crop production; soil nutrients and plant uptake; nutrition physiology; role, uptake, and mobility of essential nutrients in plants; deficiency and toxicity symptoms; root growth and nutrient uptake; efficient use of nutrients.
8. Dynamic of main nutrients in the soil; determination of available nutrients in soil and plants; sources of nutrients; fertilizers; soil amendments; inorganic fertilizers; organic fertilizers; mycorrhizae.
9. Macronutrients and micronutrients in soil and their management for food production; nutrient cycles; nutrient availability and influence on food production and quality.
10. The role of soil in shaping *terroir* and supporting quality schemes (Protected Designation of Origin and Protected Geographical Indication) for wine, olive oil, pulses, cheeses, etc.
11. Soil degradation; desertification; erosion, types, causes, consequences on food production and quality, assessment, measures for reduction, prevention, and restoration; problem soils, formation, categories, management and amelioration, possibilities for exploitation.
12. Soil pollution: types of pollutants, effects on the soil ecosystem, consequences for food production and quality; cleanup; restoration.
13. Modern technologies for soil management for food production: Remote sensing applications; land evaluation; damage assessment; monitoring and surveying tools; yield simulation models in primary food production.

LABORATORY

1. Sampling of soil and plant tissues; preparation of soil samples for analysis; drying; determination of water content of soils and plant tissues.
2. Symptoms, diagnosis and correction of nutrient imbalances; establishment of a small experiment for detecting symptoms and diagnosing nutritional problems.
3. Determination of soil color, texture, bulk density, specific gravity, and porosity.
4. Determination of total and active soil carbonate; soil reaction; pH determination; buffering capacity.
5. Determination of soil organic C and microbial biomass.
6. Determination of soil electrical conductivity, total soluble salts (Ca, Mg, K, Na, NO_3^-, Cl^-, SO_4^-, CO_3^-, HCO_3^-) and irrigation water; irrigation water quality.
7. Determination of exchangeable cations in soil, cation exchange capacity, base saturation.
8. Soil pollution; determination of heavy metals (Cd, Cr, Pb: extraction, recovery and analytical determination).
9. Incineration of plant tissues, extraction and recovery of samples for analysis.
10. Soil macronutrients: Determination of N in soil and plant tissues.
11. Soil macronutrients: Determination of plant extractable P in soil and P content in plant tissues via spectrophotometry.
12. Soil macronutrients: Determination of exchangeable K and K content in plant tissues via flame photometry; determination of Ca and Mg in plant tissues via atomic absorption spectrometry.
13. Soil micronutrients: Determination of Fe, Zn, Mn, Cu, and Mo in soil and plant tissues via atomic absorption spectrometry; determination of B in soil and plant tissues via spectrophotometry.

TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Power point presentation, Whiteboard writing, Communication with students through e-class and e-mails
OURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.*	

Activity/Method	***Semester workload***
Theory (Lectures)	60
Individual or team project	26
Seminars	18
Total contact hours and training	***104***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**Theory:** Final written examination that includes: -multiple choice questions -fill-in the blanks questions -short answer questions **Laboratory:** 75% from final written examination in laboratory that includes: -fill-in the blanks questions -short answer questions -multiple choice questions 25% from lab reports

SUGGESTED READING:

- Ando, T., K. Fujita, T. Mae, H. Matsumoto, S. Mori, and J. Sekiya. (1997) Plant Nutrition for Sustainable Food Production and Environment. Proc. XIII Int'l Plant Nutrition Colloquium. Kluwer Academic Publishers, Doordrecht, The Netherlands.
- Benton, J., Jr. (2012) Plant Nutrition and Soil Fertility Manual. 2nd ed. CRC Press, Boca Raton, FL.
- Brady, N. C., and R. R. Well. (2008) The Nature and Properties of Soils. Prentice Hall/Pearson Education. Upper Saddle River, NJ.
- Dane, J. H. and G. C. Topp. (2002). Methods of Soil Analysis. Part 4. SSSA Book Series No. 5. Soil Science Society of America, Madison, WI.
- FAO, IFAD, UNICEF, WFP and WHO (2017) The State of Food Security and Nutrition in the World 2017; Building Resilience for Peace and Food Security. FAO, Rome.
- FAO (2017) The future of food and agriculture – Trends and challenges. FAO, Rome.
- Gliessman, S. R. (2006) Agroecology: The Ecology of Sustainable Food Systems. 2nd Edition. CRC Press, Boca Raton, FL.
- Klute, A. (1986) Methods of Soil Analysis. Part 1. Physical and Mineralogical Methods. Agron. Monogr. No 9. 2nd ed. ASA and SSSA, Madison, WI.
- Lal. R. and B. A. Stewart. (2011) World Soil Resources and Food Security. CRC Press, Boca Raton, FL.
- Lal. R., and B. A. Stewart. (2010) Food Security and Soil Quality. Advances in Soil Science. CRC Press, Boca Raton, FL.
- Marschner, H. (1995) Mineral Nutrition of Higher Plants. 2nd ed. Academic Press, San Diego, CA.
- Page A.L. (1982) Methods of Soil Analysis. Part 2. Chemical and Microbiological properties. Agron. Monogr. No 9 (2nd ed). ASA and SSSA, Madison, WI.
- Roy, R. N., A. Finck, G. J. Blair, and H. L. S. Tandon. (2006) Plant Nutrition for Food Security; A Guide for Integrated Nutrient Management. Fertilizer and Plant Nutrition Bulletin No 16. FAO, Rome.
- Troeh, F. R., G. A. Hobbs, and R. L. Donahue (2004) Soil and Water Conservation for Productivity and Environmental Protection. 4th ed. Prentice Hall, Upper Saddle River, NJ.
- Weaver, R. W., S. Angle, P. Bottomley, and D. Bezdiecek (1994). Methods of Soil Analysis. Part 2. SSSA Book Series No 5. Soil Science Society of America, Madison, WI.
- Westerman, R. L. (1990) Soil Testing and Plant Analysis. 3rd ed. SSSA, Madison, WI.
- World Bank (2007) From Agriculture to Nutrition: Pathways, Synergies and Outcomes. Report No. 40196-GLB. World Bank, Washington, DC.

Performance Statistics of the last 2years

Grade (descending order)	absolute frequency	relative frequency %	sum of success rates per class
SOIL MANAGEMENT AND FOOD QUALITY			
10	0	0%	0%
9	1	50%	50%
8	1	50%	100%
7	0	0%	100%
6	0	0%	100%
	2	100%	