COURSE OF STUDY: Master's degree Innovation DEvelopment In Agrifood Systems (Ideas) (LM69)

ACADEMIC YEAR*: 2023-2024*

ACADEMIC SUBJECT Sustainable clean soil strategies (3 ETCS) - module of I.C. Sustainable innovative technologies improving soil, microorganism and plant interactions

General information	
Year of the course	*Second Year*
Academic calendar (starting and ending date)	October 16th 2023 – January 26th 2024 (Pause 11th – 20th December 2023, for midterm exam)
Credits (CFU/ETCS):	3
SSD	*Agricultural Chemistry (AGR13)*
Language	*English*
Mode of attendance	No mandatory

Professor/ Lecturer	
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Department and address	Department of Soil, Plant and Food Sciences – Chemistry and Biochemistry Section, First floor room n. 9
Virtual room	Microsoft Teams code: **t5nuigd**
Office Hours (and modalities: e.g., by appointment, on line, etc.)	From Monday to Friday, 9.00 a.m. to 1.30 p.m., following an established appointment requested by phone, e-mail or Teams.

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	*16*	*14*	*45*
CFU/ETCS			
3	*2*	*1*	

Learning Objectives	***The course, part of the IC - Sustainable innovative technologies improving soil, microorganism and plant interactions, aims to provide knowledge on improving the quality of soils aimed at reducing the use of chemical fertilizers. Students will be able to adopt sustainable measures for the mitigation of harmful effects deriving from the presence of contaminants in soil.***
Course prerequisites	Knowledges requested for the admission to the Master course.

Teaching strategies	*The lectures will be given with the aid of Power Point presentations, video clips, educational tour in open fields and companies, seminars held by consultants, practical exercises in classroom and in laboratory.*
Expected learning outcomes in terms of,	

Knowledge and understanding on:	○ Knowledge about the chemical, biochemical, and biological properties of rhizosphere. ○ Knowledge on the sustainable use of fertilizers for plant nutrition. ○ Knowledge on the physiological properties and sustainable application of biostimulants. ○ Knowledge on the main innovative and sustainable techniques for soil mitigation and remediation
Applying knowledge and understanding on:	○ The student will acquire the competence for a sustainable use of fertilizers for improving the crop nutrition ○ Ability to apply biostimulants for optimizing crop nutrition and protection by abiotic diseases. ○ Ability to apply the knowledge about the bioremediation and phytoremediation in contaminated soils.
Soft skills	• *Making informed judgments and choices* ○ Analytical and problem solving skills to independently analyze different technical situations in terms of sustainable use of fertilizers and biostimulants ○ Analytical and problem solving skills to independently propose different bio-based clean-up strategies for soil remediation • *Communicating knowledge and understanding* ○ Good ability to relate to other subjects in a multidisciplinary way on technical, human and ethical issues. ○ Ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes • *Capacities to continue learning* ○ Ability to use cognitive tools such as the information technology (IT) and the English language for the continuing self-education.
Syllabus	
Content knowledge	*The importance of the rhizosphere in the nutrient cycle of elements.* *Role of mineral elements in the plant physiology.* *Innovative techniques for the assessment of soil fertility and plant nutrient status.* *Crop nutrition in organic farming and sustainable farming systems.* *Biostimulants: classification, physiological properties and application in sustainable agriculture.* *Diffuse and point source pollution in agricultural soils: innovative mitigations and bio-based remediation approaches.*
Texts and readings	• *Personal notes of the lectures and didactic materials distributed during the course.*
Notes, additional materials	
Repository	*The teaching material is available in the Microsoft Teams Class: Sustanable Clean Soil Strategies 2023 24 (teams code **t5nuigd**)*

Assessment	
Assessment methods	The exam consists of an oral dissertation on the topics developed during the theoretical and theoretical-practical lectures in the classroom and in the laboratory/open field. Students attending at the lectures may have a middle-term preliminary exam, consisting of an oral test, relative to the first part of the program, which will concur to the final evaluation and will be considered valid for 1 year.

Assessment criteria	• *Knowledge and understanding*
	  ○ Good knowledge about the crop nutrition in organic and sustainable farming systems.
	  ○ Knowledge about the role of biostimulants for improving the quality of the products and the reduction of the use of fertilizers and pesticides.
	  ○ Knowledge on the main innovative and sustainable techniques for soil mitigation and remediation
	• *Applying knowledge and understanding*
	  ○ Ability to suggest the most innovative and sustainable techniques for reducing the use of fertilizers and reduce soil contamination to reach a zero pollution plant-soil system.
	• *Autonomy of judgment*
	  ○ Good analytical and problem solving skills to analyze independently different technical situations in terms of sustainable use of fertilizers and biostimulants and for cleaning up polluted soils.
	• *Communication skills*
	  ○ Good ability to relate to other subjects in a multidisciplinary way on technical, human and ethical issues.
	  ○ Ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes
	• *Capacities to continue learning*
	  ○ Ability to use cognitive tools such as the information technology (IT) and the English language for the continuing self-education

Final exam and grading criteria	The final mark will consider the theoretical and practical knowledge acquired, the ability to apply the knowledge, autonomy of judgment, communication skills and on the ability to integrate the acquired knowledge in a project work. The evaluation of the student is based on criteria previously fixed such as reported in the Annex A of the Didactic Regulation of the Master Course in Innovation Development in Agrifood Systems. The final mark is awarded in thirtieths. The exam is passed when the mark is greater than or equal to 18.
Further information	
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